



Astronomy and Mathematics in Ancient India

Dr Suvarna Nalapat

BRIHADVARAHISAMHITA, VARARUCHIVAKYA, GRAHA[Date]NYAYADEEIOIKA

Astronomy and Mathematics in India

- 1. Brihat Vaaraaaheesamhitha**
- 2. Vararuchi Vakya**
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Brihat varahisamhitha.

There are three sections to Indian astronomy. Hitherto, I had been discussing Panchasidhanthikathanthram which is the thanthra or method of calculating mathematically and logically the positions of celestial objects, the cosmic relationships and structure which is equivalent to modern astronomy and astrophysics.

The second part is samhitha, which deals with the meteorological observations of natural and planetary events. The text that I depend upon is the one with Hindi translation of Baladevprasad Mishra, son of Sukhananda Mishra of Muradabad, (Ref 1) published by sree venkateswara steam press in Samvath 1997, saka 1862. (Now it is samvat 2054, saka 1919, Christian era 1997). If we consider that observation of natural and cosmic

phenomena and its effects on people and nations was the first to develop and then only the logicomathematical explanations for them,samhitha is ancient to Thanthra in human history. (observations first analysis and explanation last)

In 1978-79 , I started to study Panchasidhanthika ,which was in the collection of my mother's uncle,sri Nalapat Narayanamenon.His disciple and my Jyothishaguru,Edappal sri soolapaani warrier told me that Nalapat used to call himself the maanasaputhra of Varaha mihira and had all the 3 major works of varahamihira in his library. Hora was given to the disciple (himself) and he gave it for me to study .Thus it was Hora(astrology and its effects on individuals) that I studied first and then

Panchasidhanthikathanthra, the logicomathematical aspects of its basis. Where is the other ,the third major work,Brihath samhitha? In 1997,when my cousin was removing old books from her house,Sarvodaya, she found an old Sanskrit text in it,and gave it to me saying that this Sanskrit book might be of Uncle,and may be of use to Suvarna. Thus after 42 years of uncle's death,this book surfaced from nowhere ,just for me to read and understand.

The translator calculates the time of varahamihira according to the yearly gathy of ayanam.He says from AD 147 which is time of Hipparchus ,431 years before (in BC 284) was the time of Varahamihira and from it 1676 years before lived Parasara (BC 1960,a handwritten manuscript of Parasara I

have seen in Theosophical society library) He says that it is not merely by counting days, but by observing the signs in sky during sunset and sunrise (moon, stars, other planets, etc) and by the center's (sun) keelaka (light) and its chaaya (image) of brihatmandala and its coming and going that the ayana is determined which is a very very pertinent point observed by all the 5 sidhanthaas earlier said in the thanthra part. This means, when we say, the sun is now entering Karkitaka (cancer) or in Dhanishta star, etc is by looking at the group of stars seen with the sun during setting or sunrise.

Another way is to look at the chaaya of earth, sun, moon, other planets etc one can say the relative position of sun, moon and earth and other planets. As well as the position of the kraanthibhedanabindu. This was explained in Panchasidhanthika

thanthra. Bhattolpala, the commentator of Varahamihira has quoted the words of Paraasara in his commentary. According to this from beginning of Dhanishta to first half of Revathy is sisira, from last part of Revathy to last part of Rohini is Vasantha, from beginning of Mrigasira to beginning of Aslesham is Greeshma, and from Aslesha to Hastha is Varsha.

The zodiac is divided into 27 stars, each star with 13 amsa and 20 kala (now as 13 amsa 20 minutes). This division was done after several centuries of continuous observation. In vasantha rithu, the samarathradina on which part of zodiac the sun stands is called the vishuvat. It is Piscium or Revathy yogathara with Aswathy in Mesharasi in Indian calendar. In suryasidhantha it is 359 degree 50 kala in Revathy.

Brahmaguptha records it as 360 degree

in beginning of Mesha. The Dhruvaka, akshamsa of Parasara with the rithu and Ayanam are as follows.

Beginning	End	Rithu	Ayanam
293.20	353.20	sisiram	utharayanam
353.20	53.20	vasantham	utharayanam
53.20	113.20	greeshma	utharayanam
113.20	173.20	varsham	dakshinayanam
173.20	233.20	sarath	dakshinayanam
233.20	293.20	Hemantham	Dakshinayanam

In Varahamihira's time sisira started from 270 degree exactly .That is

utharayana was exactly in first degree of Makararasi. The difference between Parasara and Varahamihira being 13 degree and 20 mts or one nakshathra avadhi, the translator calculates as 1676 years depending upon the figure of 5011 vikala of gathy of kranthipatha (fixed by western scientists of the time). The first varahamihira of Ujjain lived in this period and the second in AD 427. In Vangadesapanchanga in 1915 saka era beginning ayanam is 20.54.36 vikala or the same as that of Varahamihira's time. Rithu in Vangadesapanchanga (Table 2)

Praaya	Beginni ng	rithu	Manthavy a
10 Pousha	Makara	Sisira	Utharayan am

10 Magha	Kumbh a		
10 Phalgun 10 chaithra	Meena Mesha	Vasanth a	Kranthipat ha
10.Vaisa kham 10 Jyeshtha	Rishab ha Mithun am	Greesh mam	
10 Ashadam 10 Sravana m	Karkita kam Simha m	Varsha m	Dakshinay anam
10 Bhadrapa dam 10 Aswinam	Kanya Thula	Sarath	Kraanthip aatha

10 Karthika m 10 Margasir a	Vrischi ka Dhanu	Hemant ha	
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Taking valsarikagathy as 54 vikala the Vangadesa jyothishis find 421 sakavarsha difference between varaha and surya sidhantha in 1394 years. Since India is a large country, observers in Bengal and in the extreme west of India have differences in rithubheda and in the sunsets and sunrises and hence two ayanamsa are in use in India.

1.22.53

2.22.37

Among the vangadesa calculations according to translator the purest is that

of Bapudevasasthri and according to it,during the translators time ayanamsa is 22.7.24.If kranthipatha varshika valsarikagathy is taken as 501 vikala , varahamihiras time is 1592 years before,in sakavarsha 270,or samvath 405.

During Hipparchus of Mishradesa, chithra yogathara was 6 amsa west of kranthipathabindu.Hasserl says it is 20 amsa 20 kala east of it.The difference is 26.24 or 1897 years.Hipparchus lived in AD 147.In AD 174 chithra was in 174 degree of zodiac.In time of surya sidhantha and varahamihira it is 6 degree east.Or kranthipatha and chithra were both in 180 degree zodiac.Therefore 431 years before Hipparchus was the time of Varahamihira and of (modern). Surya sidhantha

Before suryasidhantha of varahamihiras period there was an old suryasidhantha, praacheenasuryasidhantha, of several rishiparamparas. Parasara was in the rishiparampara of Brihadaranyaka upanishad. Varahamihiras father Adityadasa belong to the suryasidhantha parampara .In Brihad jathaka ,Varaha remembers 11 poorvasoori of his parampara.

- 1.Maya
- 2.Yavana
- 3.Manitham
- 4.Sakthy
- 5.Sathyan
- 6.Bali
- 7.Vishnugupthan
- 8.Devaswami
- 9.Sidhasenan
- 10.Jeevasarma
- 11 Prithuyasas

About this he says, Jyothisha is the ancient samyaksaasthra and samkhya of Bhaaritha. (This is important because the samkhya was the most ancient of the six darsanaas and kanaada in his vaiseshika thanthra describes the correct meaning of samkhya and the difference of it from ordinary mathematical calculations) When it was studied by Mlecha and yavana even they became respectable. Which indicates that the quotes of Varahamihira of the yavanaguru does not indicate that he has received anything from them, but the fact that he knew the yavanas who had learned jyothisha from Bharatha and respected them for the effort and the knowledge they acquired which shows his nature as a fine human being.

The fact that Mihira has been seen in the name of a Persian king who lived in AD 534-580(Bujur Guje Mehera)and that this king has translated Panchathantra into Persian and in Panchathantra Varahamihira's name is mentioned shows that Varahamihira lived before Panchathanthram period.

Table 3.Nakshathra positions in Suryasidhantha and Brahmaguptha

Nakshathra and their number	Kalpitharopa	S.S. Dhr uvak a East west	B.G Dhr uva ka	Aks ham sa	Dista nce of yogat hara from begin ning of naksh athra
Aswini 3	Thuraga mukha	80	8	10 N	48N

Bharani 3	Yoni	20	20	12N	40S
Krithika 6	Kshura	37- 30	37- 28	40- 30N	65 N
Rohini 5	Sakata	49- 30	49- 28	40- 30 S	57 Equa tor
Mrigasi ra 3	Harinam ukha	63	63	10 S	58 N
Ardra 7	Rathnam	67- 20	67	11S	4 Equa tor
Punarva su 4	Guhagrih a/Dhanus	93	93	6N	78S
Pushya 7	Baana	106	10 6	N	76 Midl e
Aslesha m 5	chakra	109	10 8	7S	94 equa tor

Magha 4	Guhagrih a/palanq uin	129	12 9	0N	54 S
Poorvap halguni 2	Sayya/be d	144	14 7	12N	46N
Utharap halguni 2	sayya	155	15 5	13N	50N
Hastha 5	hastha	170	17 0	11S	60
Chithra 1	Pearl,dee pam	180	18 3	205	40
Swathi 1	pravaala m	188	18 8	37 N	74
Visakha m 4	Thorana, chakra	213	21 2.5	130 N	78N
Anurad ha 4	bali	224	22 4.5	1- 44 S	64 Equa tor

Jyeshta 3	kunthala	229	22 9.5	4S	14 equa tor
Moola m 11	kroditha	241	24 1	8.3 0S	6 east
Poorvas hada 4	sayya	254	25 4	50- 30S	43
Uthrash adam 2	hasthivil aasam	260	26 0	5S	The midd le star of poor vash ada
Abhijit 3	Thrikona	266 -40	26 5	60N	Brig htest star
Sravana m 3	thrivikra ma	270	27 8	30N	after poor

					vash ad After uthra shad a midd le
Dhanish ta 4	Mridang a	290	29 0	36 N	After srava na shes hapa da west
Sathabh isham 100	vritha	320	32 0 0- 18 S	0.3 0S	80 Ujju ala

			0- 20 S		
Poorvab hadrapa da 2	yamala	336	32 6	240 N	36 N
Uthrabh adrapad a 2	sayya	337	33 7	26 N	22N
Revathy 32	Murajam	359 .50	36 0	30	79S
Total of 232 stars in 28 star clusters studied	Simsuma ara				

Table 4 Dhruvaka Akshamsa of some main stars

Nakshathra	surya sidha ntha	Brah mag upth a	sidhant hasarva bhouma	Grah alag hava
Agastya- Canopus	Dhru vaka 90 Aksh amsa 80- 87	87 77 SE	76 S	80
Lubdaka- sirius	80 40S	86 40S	84-76 40S	80

Agni, Veda (Tauri)	52 8N	52 8-14	57-4 8N	43
Brahmahrid aya(Kapila) Cappella	52 30N	52 30- 49	58-36 31N	56
Prajapathy delta aurigi	57 37N	57 37- 30	56-53 31N	56
Aapaswase aapa: Delta virginis	180 3	180 9	180 3	183 39N 3N

According to Saakalpasamhitha,
akshamsa of saptharshi is as follows

Krathu 55 N

Pulaha 50 N

Athri 56 N

Angirasa 57 N

Vasishta 60 N
 Mareechi 60 N
 Pulastya 50 N

In Brahmaguptas time chitra is in 183 degree zodiac and is only 3 degree different from Suryasidhantha and Brahmagupta lived in saka 421 ,about 215 years after second varahamihira .The view that Bharatha jyothisha did not know anything about ayanamsa before Aryabhatta is questionable.Just as there are different opinions in the varsha parimana and other scientific things among scientists ,there had been different views among ancient scientists too about Ayanamsa and all the important scientists right from Paithamahasidhantha,vasishta,parasara etc knew about ayanamsa .In Vasishta sidhantha commentary vishnuchandra

has said about the paribramana of the paridhi of kranthipatha.(revolution of the orbitary cycles were known).According to Aryabhata(Ref 2) in a kalpa there are 4320000000 years and 1582237500000 stars rise in that time.or,so many days are there.In Brahmasidhantha it is 1582236450000.According to Brahmaguptha of Brahmasphuta sidhantha this is accepted.

Bhaskaracharya in sidhanthasiromani (Ref 3) also is of same opinion.

Bhaskaracharya in his vaasanabhashya criticizes the view of the translators of suryasidhantha including that of some Arabic authors about the chapalaavastha of ayana asking:”If only during surya sidhantha time is the ayanamsa accepted ,why not suryasidhantha speak of the revolution of the limit(paridhi)of nakshathrachakra(zodiac)which is

mentioned in Agamaas?The questioning is o the commentators who have not understood suryasidhantha properly,not to suryasidhantha.Because,the nakshathrachakra paridhi paribramana is actually mentioned in suryasidhantha , which is unknown to the commentators of suryasidhantha.

*Thrimsat krituo yuge bhaanaam chakram
praak parilambathe
Thadgunaadbhadinaibhikthaadhyuganaa
dhyadavaapyathe
Thadho sthrighnaa dasapthamsaa
vigneyaa ayanaabhidhaa*

In one mahayuga 600 or 30X20
nakshathrachakra .In the abhilashitha
varsha dina or ahargana is multiplied by
600 and divided by either bhoodina or
vatsara ,and convert to bhuja ,and then

multiply with 3 and divide by 10. We get ayanamsa.

Another sloka used in India by Jyothishis for ayanamsaganitha is

*Yugeshtasathakrityo bhachakram
praakvilambathe
Thadguno bhoodinair bhaktho dhyuguno
yanakhechara:*

This was translated by the English speaking scholars of the time as:

Multiply ahargana or number of mean solar days for which calculation is made ,by 600 and divide by product of 7 days in a yug. Of quotient take sine and multiply by 3 and divide by 10 to get ayanamsa.

If we do the 2 methods given in the 2 slokaas

1st sloka year 1997
 $1997 \times 600 = 1198200$
 Bhoodina $1997 \times 366 = 730902$

$$1198200 / 730902 = 600 / 366 = 100 / 61 = 1 \frac{39}{61}$$

2nd sloka
 $X \times 600 / 7 = \text{quotient}$
 Sine of QX $3/10$
 If X is 366
 $366 \times 600 / 7 = 219600 / 7 = 31371 \frac{3}{7}$
 Sine of 31371 $= 0.8100508021$
 $0.8100508021 / 10 \times 3 = 0.2430152406$
 Sine 1 $= 0.8414709848$
 This $X \times 3/10 = 0.2524412954$
 Therefore between 0.2430152406 and
 0.2524412954 lies on some bindu, the
 ayanam. The difference between the
 two is 0.0094260548 and it is the

difference between these two methods described above.

According to Parasara the nakshathrachakra revolves 581709 times in one kalpa. According to Aryabhata it is 578159 times. Prathivalsaraayanam for these two are 52-3 and 52-1 respectively. For surya sidhantha it is 54 vikala. For parasari samhitha ayana is moving like a pendula or a jhoola in Mesharasi 27 amsa to east/west in the middle point. In Dasageethika Aryabhata accepts this view of Parasara but he says it is only 24 in Aryashtasathika. Suryasidhantha and Varahamihira takes it 27 degree as Parasara .If Aryabhata thinks that from 27 the distance is now reduced to 24 ,Varahamihira lived 215 years before Aryabhata.(9 yrs before saka era)

According to Bapu Apoorvachandra Aryabhata was born 1700 years after Yudhishtira .According to Colbrooke Aryabhata was the contemporary of Deophantus of Greek who is considered to have discovered Bheeja ganitha in Greece.(AD 319).

Varahamihira quotes Gargasamhitha several times in his samhitha.The time of Gargasamhitha according to Karn ,a scholarly teacher ,is BC 44 or before.

But there had been Garga in several centuries before in several guru paramparas and Garga is not a proper noun but a common noun for several people.Parasareeyam is older to Gargyasamhitha from its chandas and from the position of ayanam.

Kranthipatha paribramana of paridhi is in one kalpa 189411 times in Vasishta sidhantha and ayanam in one year is

60.03 vikala. Hipparchus and Ptolemy both accept this view of Vasishta sidhantha. (85 yrs one amsa for Hipparchus, 100 yrs one amsa for Ptolemy)

In Sidhanthasiromani Bhaskaracharya says vishuva and kranthimandala become one in kranthipatha, or kranthipada is when kranthivalaya become one with vishuvath. The bhaganam of it in suryasidhantha is 3000. Ayanachalanam and kranthi paatha are one. Mudgalabrahmanaas of Panchala calculated it as 199669 bhaganam in one kalpa .

Sidhanthasiromani states for Mudgala $20 \times 30000 = 600000$ and in that karma 5909 vikala was the calculated ayanamsa.

In 60 yrs 1 degree
60000 yrs 10000

10000 degree =27.77 poornabramana
 27 poornabramana and .77/27
 bhaagam

When kranthipathabindu moves 310 degree in 18600 years ,it goes back 50 degrees and therefore in 18600 years itself,360 degrees are completed .The 50 degree backward motion is taken as 52.1,52.3 by Aryabhata ,parasaraThe oldest Paithamahasidhantha takes the view that in 18300 years itself the ayanam is back in its original position. (Why were these scientists so much concerned with grahayogaas and the time when the ayanam reaches its original starting point?Readers are adviced to refer to the chapter on Mahadwaitha where Stephan Hawking tells about Hubble's view that the moving /revolving spiraling galaxies to start from a single point dense in

spacetime as a Big bang which is the sphota of the naadabindu in Indian science .Then only we will grasp the scientific outlook of our ancestors.They had differences of opinion about the time periods but about the essential nature of universe they had a consensus of opinion formulated by scientific logicomathematical analysis)

$366 \times 100 / 2 = 18300$ years is what Paithaamahasisidhaantha calculated.

In an year with 366 days,with 60 years one degree and in 21960 ahargana one degree

In 18300 years or 6697800 ahargana 305 degree which is 26 to 27 degree away from Poorvabhadrapada/Revathy yogathara.That is in Mesha zero degree ayana equalized either to front or back of it about 26 degrees.This includes 52 to 53 degrees between Karthika and

Poorvabhadrapaada. This ayanamsa is (declination) observed (dhrikkarma) and corrected, and it is not by mathematics alone but by dhrikkarma and correction that all astronomers right from Paithamaha has done it. But the new astrologers of India are going on saying that the ayanamsa has to be changed, according to their own calculations.

Ayanamsa is not changed by calculation, but by the order of the universe, and the scientists observe it and then calculate and predict the next change and wait for it through generations of disciples for that to happen. The astrologers who said that in saka 444 there is a new ayanamsa has also done it based on 1 degree in 60 yrs just like Paithamaha. Before karnakuthoohala of Bhaskaracharya many astrologers of his time did not

understand what is meant my
 ayanamsa. Karnakuthoohala was
 written in saka 1105 and in it ayanamsa
 is 11 (in 60 yrs 1 .therefore in 11
 degree it is 660 years and
 paravrithy jyothish method is to
 calculate 1105 as saka varsha
 ayanamsa arambha)The error of
 paravrithi jyothishi is because they
 haven't understood what Bhaskara
 meant. When ayanamsa corrects
 itself, the observation and calculation is
 for the guru and disciple to understand
 the process, not to change it, because
 human beings cannot change it .If
 someone changes it ,that person is
 making confusion to all his coming
 generation of scientists. What looks like
 saayana stars are not saayana but
 nirayana fixed stars for an observer on
 earth who has a relative view is

something which one has to understand. This is the law of two coordinate systems which appear to be in inertia .Hunter gives a list of Astronomers before Bhaskara in Ujjain who used to observe(Drikkarma)zodiac and do scientific studies using yantra and thantra .

The second varahamihira of the list is the author of Brihadsamhitha.

Varahamihira 1	saka 122
Varahamihira 2	421
Brahmaguptha	550
Bhattolpala	890
Swetholpala	939
Varunabhata	962
Bhojaraja	964
Bhaskara	1072
Kalyanachandra	1101

In one of the stone inscriptions of Bhojaraja ,919 samvat 749 saka is seen

.So either there had been more than one Bhojaraja or the time of Bhojaraja is ancient than what is given by Hunter. In Sathananda's Bhamathy which is a pure Karanagrantha (1021 saka) sathananda writes I have said these according to advice of Varahamihra (Mihiropadeshaad)and one scholar took it literally and tried to prove that Varahamihira lived in saka 1060.I am also writing my Jyothish books according to what is adviced by Varahamihira and if someone in future says that Varahamihira lived during my time(1997 christian era)we need not get upset.

What we call Kham /aakasa or timespace is a huge mandala (raasimandala) of oorja(energy)where sound and lightrays constantly travel to

give name/shape(naamaroopa)to the prapancha.Among the many universes ,ours is only one tiny sample and our solar system is only a spek of sand in it.And the observer in it,in a small earth,in a locality which is only a paramaanu of it has to understand himself and his environment to understand others and the cosmos and the architect /architectural laws of the cosmos from it .The kalpa/yuga ganitha,the panchanghaganitha and the measurement of local geography has to be understood in this wide sense.Those who go on discussing whether Ramans ayanamsam or Lahiris ayanamsam is correct has to understand this first.The continuum of two coordinates and its inertia or nirayana is understood after theory of relativity in western world, and relativistic quantum physics is now

exploring the multiverses and the paramanu of Gargya and Kanaada and coming to what was originally said by Indian scientists.

The Hindi translation of Brihad samhitha is prepared after examining Bhattotpala, Panchanana Tharkaratna of Bengal, Arunodaya teeka of Dravidadesa .

About samvatsara or astronomer/astrologer Vishnugupta said: If a man decides to cross the ocean he can do it easily according to gathivega of vaayu. But, to go near the Mahaarnava of Kaalapurusha, or even to think that I should go near it is not possible for a human being who is not a Rishi. If one cannot even think of going near it, how can one cross it?

The samhithaaparanghatha is a daivagna,his mind becomes one with Daiva/divine and merge with thrikaala and hence is a great Rishi .Only he can experience the timelessness or kalpa , amritha or nitya avastha and he alone merges in Brahma .

Na saamvatsara padee cha narakeshu papadyathe

Brahmaloke prathishta cha labhathe daivachinthaka (B S)

He doesn't get Naraka.He gets Prathishta in Brahmaloaka alone.A scholar who grasps this difficult subject according to the grantha,with meanings becomes agrabhuk,sraadhapoojitha ,pamkthipaavana Agni according to varahamihira.Even if he hears the criticisms or insults hurled at him ,he does not pay heed to them,because his pure intellect is always in his saasthra,

and always happy in Brahmagnaana.
That is Brahmanalakshana according to
varaha as well as to sankaracharya in
Apasoodradhikarana of Brahmasuthra
bhashya.

Ch 2 Kethu in Brihadsamhitha

In third chapter (Adityachaara)
Varahamihira calls Dakshinayana ,when
the female principle earth starts to
distance herself from the male principle
sun ,as vikrithy and Utharayana when the
opposite happens as prakrithy. When
female and male come together there is
prosperity and when they split there is
famine and amangala. And if during that
time Thwashta covers suns mandala 7
kings on earth are killed. And people are
afraid of famines ,hunger and battles for
the sake of food .Kethu has two names
.One is Thaamasa or dark one, and the

other is keelaka or bright one .He is born out of Rahu (which is earth itself,since ahoraathra the word with deletion of first and last letters become Raho when read in kharoshty)There 90 types of kethu classified according to colour,shape, position etc and observing them position of sun relative to earth and moon can be known.

When kethu rises sky become covered with dust or watervapour and strong winds with sweet taste blow pressurizing treetops and mountains.The seasons come when it is not their time.Animals and birds run around with thirst .Thunder ,earthquakes and ulka falls occur.Rahu is seen as sikhy(serpent or sarpa)and as a jwala (keelakam).Clouds form but do not give rains and rivers become dry and slim and plants become very scanty .People suffer hunger and famines break

out. Because of it wars happen and kings are killed. The battles, death of rulers, diseases and famine and fear from thieves are predicted as effects of kethu since it had been observed to produce hunger and poverty and the effects thereof. People are killed by fires and dust winds also. If Prathisurya (reflected sun) is seen on north of sun, rains happen. If on southern side hurricane happens. If on both sides people die from water (salilabhaya) and if below destruction of world and if above destruction of king. If sun is krishnavarna or vichithraneela varna and if donkeys bellow seeing it, entire population die.

In 4th chapter (chandracharam) varaha says the effects of chandragrahana by various celestial objects.

1.Mars –bad rulers of Thrigartha, Malwa, Koulinda,Sibi,Ayodhya,Kuru,Malsya,& sukthidesa ,the ministers and commanders of these places with their army and vaahana are destroyed within 6 months

2.Saturn.-aayudha and hunger destroy kings of eastern directions,of Arjuna vansa and of Kuruvansa within 10 months.

3Mercury-lack of rain and famine in Magadha,Mathura,and venaatheeram (venaad)and krithayuga begins for people of west coast.

4.Brihaspathy-kings of Gandhara, souveera, keera,dravida,sailadesa,and Brahmins of these desa and the food (dhaanya)are destroyed.The sreshta kings are destroyed by this occurrence

5.Sukra –Bad kings and people of panchala, kekaya,kuluthaka,useenara suffer .

In krishnapaksha the effects are fully experienced and in suklapaksha only partially experienced.

6.Ulka –Killers,murderers and kings are destroyed depending upon their janma nakshathra.

Chapter 5 is Raahuchaara.This chapter describes Rahu well.sloka 1 and 2 says Rahu is amritha though it has a divided head and body and it also has Golaa shape like sun and moon (Indwarka mandalaakrithy)but it has no whiteness like them (moon has reflected light,and sun has light)and due to abhaava of light it is called a dark graham or Thamograha and not seen in sky by the observers(on earth)but can see it during parvakaala

(grahana)since its gola shape is then reflected on sun and moon.According to some it has a mukha and a tail(pucha) like a serpent and according to others it is amoorta and thamomaya and is the son of simhika (simharaasi).

In Indonesia earth is considered to have a face and a tail just like varahamihira describes here.Therefore they call earth as an Ulko.For Indians Ulka is a shower of bright objects from sky with serpent shape .But in Dravidian language Ulakam is also the world or earth.In veda earth is a Goddessa with dark face and bright tail and is called sasarpini due to its shape of a serpent.

In Egypt it is described as serpent with a split head.This kaalasarpa(serpent of time)is etymologically and culturally seen in all the old civilizations .The term

simhikeya needs special attention. In Egyptian papyrus of 2000 years back ulka are described. In Chinese writings of BC 1768 they are described. In Korea and Japan every 33 years the ulkavarsha happen and this is what now we call the leonid showers. That is before 3500 years the eastern cultures knew the leonid showers. Leonid showers are seen in Karthika/Agrahaayana months in Leo rasi(simharaasi) from November 10 to 18 and their maximum activity is on November 16th. (See Meteors by V. Fedynsky.) Leonid or Leo is simhika and the sons of Simhika are simhikeya. This name is used by all Indian scriptures, scientific texts as well as Puraanas and they were known to Chinese and the Europeans described them for the first time in 1799, 1832, 1833 only. Until medieval time ulka or meteor

ws considered phenomena coming from earth and Aristotle also believed that. In 1734 Russian scientists studied it. In 1855-56 England started studies about them. Shiapherelli in Italy and Newton studied them. The relation of Meteor and comet was first described by Shiapherelli in west ,but we find Indians always relating them as aspects of One phenomenon. In page 37-38 of V.Fedynskys book we find a picture of the meteor shower seen in Danilova village of Pensa drawn by A.Yusupov (on September 24 of 1948) and it is in the shape of a serpent.(fig 1) October 11th 1948 Fesekov saw ulkavarsha as a serpent with long tails between star clusters with a dazzling white hue on head and red tail. This is the shape of Rahukethu described by Indians also. The modern scientists now have found out

that the meteoric dust form a shiny tail around our earth in its journey around sun. The words ulka, ulakam, bhujaga shape, division into mukha and puscha, simhikeya, thamograha etc are therefore Sanskrit and Dravidian, Indonesian words which we have to reconsider scientifically.

Sloka 6 says that Rahu is amoortha and mandali in its head and within 6 raasi (bhaganaardha) it travels regularly rhythmically. Mnadala is a spheroidal field. Mandali is also a serpent which travels spirally. 6 raasi is 180 degree. And within 180 degree regularly cleaving the sun and moons passages earth travels as a dark serpent sometimes showing its bright tail.

5th sloka says if the sancakra of Rahu is not regular how can one predict ECLIPSE? If tail and head are separate

how can a eclipse happen? These 2 questions show varahamihira knew what he is talking about. In sloka 6 he says serpent eats with face nt with tail. Nor with portion in between head and tail. Hence the eclipse is due to the spherical dark part or earth proper. In 7th sloka he gives answer to those who believe that there are 2 Raahu. If so, when moon is eclipsed or sets or rises ,because of its samagathy sun also should be seen eclipsed. This we do not see. Hence there is only one Rahu which eclipses the sun and moon at separate times. 8th sloka says during lunar eclipse moon enters the bhoochaaya, and during solar eclipse moon enters sun. Therefore we do not see moons eclipse in western direction, or suns eclipse in eastern direction. Lunar eclipse occur only in

pournamasi when moon is rising in east and sun sets in west.

10th sloka explains this further.14th sloka says that Rahu got a boon from Brahma to be amoortha and dark and to be contented with the type of yagna done by people on it and therefore,earth is contented and amritha by the yagnaamsa of its people.Only during eclipse we know its presence or shape .To predict a eclipse mathematically we have to be sure that it is the north/southern path of moon,and in other times only ulka and comets can be predicted.(sloka

16)Varahamihira thinks of eclipses due to 5 planets and he says I have described eclipse,vaalana and how to see it with avanathy in panchasidhanthika

When earth is in Mesha eclipse cause destruction of warriors and kingsand those who live with fire of panchala.,

kalinga,soorasena,kamboja,oungam,kira
tha In Rishabha for Gopa,their cows,and
relatives, In Mithuna for sreshtaangana
(fine ladies)kings,saamantha, powerful,
artists,people living in coasts of yamuna
,Bahleeka,Matsya and Sumhadesa.

In karkitaka for Abheera,sabara,Pahlava,
malla,matsya,kuru,saaka,panchala,vikala
and in simha for pulinda,truthful kings
of Mekala,vanavasi,Aranyaka,and in
kanni for plants,poets,writers, musicians,
saali foodgrains of asmaka and of
Thripura. In Thula avanthi,aparantha
(western coast of the ocean)and poor
people and vaniks ,dasana of these areas
Marudesha,kaschapadesa,are destroyed.In
vrischika udumbara,Madra,choladesa
,trees ,great warriors and vishavaidyas
suffer.

In dhanu ministers ,horses,videhaas,
malla,panchala,vaidya,vanik,dhanurvedi,

and in Makara people of Matsyadesa, ministers, neechakula, doctors, old warriors suffer.

In Kumbha girijana in Mountain tops and caves, western countries, weightlifters, thieves, abheera, darada, Arya, simhapura people, Barbara are sufferers. In meena people of coastal regions, riches within the ocean, noble men, intellectuals, scholars and people who live with water (fishermen, shipowners etc) suffer most. After this he proceeds to the 10 types of Graasa. The dasagraasa are Savya, apasavya, leha, grasana, nirodha, avamardha, aarooha, aaghraatha, madhyathama, thamonthya. In savya the entire complete eclipse happens and there is total aathma layana and it is a mudritha and abhaya state. In apasavya kings and thieves suffer. When the shadow of Rahu just licks the mandala as if a jihua (tongue) that

eclipse is called leha. All living things are happy when this happens and there is a lot of rains and growth of plants and hence food. If $\frac{3}{4}$ th, $\frac{1}{2}$ or $\frac{1}{4}$ of mandala is eclipsed then it is grasana. It is bad for proud kings and proud nations. There is fall for them. If the central part of mandala is completely covered by the gola of Rahu and only the paridhi of mandala is seen as a bright halo (corona) it is called nirodha. This is a blissful darsana for all living things. After completely covering the mandala the Rahu stays there for more time it is called avamardhana. There is total darkness and the important nations and kings are destroyed. Aarohana is described in sloka 49 like this: The graham is in the shape of a golavrita. On it Rahu covers entirely for a kshana, and then to make it visible the rahuchaaya

rises (the lower part of the golavritha being visible. This is Aarohana and when it occurs there are great wars between kings. When we expire onto a mirror we find the mirror covered with watervapour. Just like that the vaayumandala of Raahu(earth) alone touches the grahamandala and forms bhaaspa and then it is called aaghraatha, and when this happens there is good rains and prosperity to the world. In the middle part a small portion is dark, and paridhi is nirmala and that is madhyathama, and the madhyadesa suffer from destructions and udararoga. In chandramandala if rahu makes a bahula or big shadow on the behind, and small on the front (opposite seen side) it is thamonthya and there is lack of plants and fear for thieves. Colour of the sun and moon which are undergoing eclipse also is taken into

account according to chromodynamics.If they are white prosperity and food in plenty ,but Brahmins are having sufferings.

If colour of agni,agnipeeda,and all those who do agnikarma suffer.If green colour, increase of diseases and destruction of fruittrees like mangoes.If kapilavarna animals destroyed and famines happen.If red,famines and strong rains,danger of birds,and if dhoomra only slight rains but food in plenty and prosperity.If multicoloured hunger and destruction of kapotha and sudra.If bright as a yellow rathna enough food and destruction of vaisya .If seen as aarchis(flame of agni) agnibhaya.If like a stem of darba it is shyama or haridra like turmeric death occurs.If seen as paadalipushpa asanipaatha seen.If red with dhooli or dust ,kshathriyas destroyed and there is

good rains. After mentioning a few more effects due to eclipse of other planets (other than earth) varahamihira states that whatever bad effect is predicted here is nullified if there is good aspect of Jupiter or vyazha. We know that Jupiter is capable of changing the objects with prolonged orbits to short orbits (like Trojan group) and these objects, sun and Jupiter at 60 degree difference in a right angle triangle is called libration point. The effect of this phenomenon is described by Indian astronomy also. If we observe strong wind, meteoric showers, dustwinds, earthquakes, darkness or asanipaatha, we can expect a eclipse like this.

Strong wind-within 6 months

Meteor showers-within 5 months

Dustwind-within 4 months

Earthquake-within 3 months

Darkness-within 2 months
 Asanipaatha(fireballs)within one month.
 Eclipse with Mars is bad for people of
 Avanthi,Kaveri delta,and Narmada
 banks. With Mercury ,for Antharvedi,
 sarayu,Nepal,eastern banks of the ocean,
 sona river areas and especially to women
 and children ,kings and warriors of these
 areas and scholars.If Brihaspathy cause
 eclipse sindhudesha ,north India,scholars
 ,kings,ministers,elephants,horses etc are
 destroyed.If with Venus,Daseraka,
 kekaya, Ayodhya,Aryavartha,Sibi ,their
 women and ministers etc suffer.If Saturn,
 desert areas,Pushkara,sourashtra,its
 people and armies and the girivaasi of
 Gomanthaka and Paariyathra are
 sufferers.

Depending upon the Months it is given
 like this:

Karthikamaasa-Those who live with agni,Maghada,kings of the east,Kosala, Kanmasha,surasena,kasi etc suffer,and the king of Kalinga with his servants is killed but brings prosperity to people of kalinga.

Agrahaayana-

Kashmere,kosala,pundra,aparantha(western parts of India)southern parts witness destruction of their somapaas.Others get good rains and prosperity.

Poushamaasa-uparodha of Brahmins and kshathriyas ,destruction of saindhava, kukura,and videha,rains less,fears and famines.

Maagha-the Vasishtagothra who are devoted to their parents,people who are devoted to swadhyaya, elephants, horses, Anga,Vanga,and Kasi people suffer grief.Farmers get enough rains.

Phalgumamaasa-Vanga,asmaka,avanthi and mekhaladesa,dancers,plants ,noble ladies,warriors and kshthriya and tapaswi suffer.

Chaithra-

artists,writers,musicians,beautiful ladies who live with their beauty,scholars of nigama,goldsmiths,Poundra,Undra(orissa)kekaya ,asmaka kings suffer.Rains are vichithra .(unpredictable)

Vaisakha-

Cotton,ellu,ocean,Ikshaku,Oudh,saka,kal inga suffer.But food will be enough.

Jyeshtakings,dwija,queens,plants,rains,m ahaagana ,people of salwadesa,

Nishaadha are sufferers.

Ashada-wells,rivers,tanks and fruits and vegetables are destroyed.In Gandhara, kashmera,Pulinda,cheenadesa rains lasting for one mandala(41 days)is obtained.

Sraavana-

kashmera,pulinda,china,yavana,kurukshe
thra,gandhara,madhyapradesha,kamboja,
ekasapha,saarada gets good rains and
food and people of these areas become
happy.

Bhadrapada-

kalinga,vanga,maghada,surashtra,Mlecha
,suveera,darada,saka areas have their
women s pregnancy aborted.But there is
enough food in these areas.

Aswina-kamboja,china,yavana,and
Bahleeka who makes trouble,sindhudesa
,Anartha,Poundra and the doctors and
kirathaas destroyed.No famines.enough
food.

There 10 types of grahanamoksha for
both sun and moon .They are two types
of Hanubheda,2 types Kukshibheda,2
types vaayubheda, samchardana, Jarana,
Madhyavidarana and Anthyavidarana.

If the Moksha happens in Agnikon it is dakshinahanu and in northeast it is vaamahanu. If in south it is dakshina kukshi and in north it is vaamakukshi. In niruthykon dakshinavayubheda and if in vayavya it is vamavayubheda. If eclipse starts in east and proceeds forwards and then ends it is samchardanam. If from west and ends in western side itself it is jarana. If the middle is first shown during end of an eclipse it is madhyavidarana. If all around is bright and pure and middle is dark it is anthyavidaranam. Whatever is said now is for Moon. the same is for Sun also but one has to consider whatever is said as west for moon as east of sun in opposite direction. (Because sun is a star and moon is not their movements of direction are opposite). After completion of an eclipse the astronomer/ meteorologist has to observe certain

features within 7 days of the eclipse and if these are observed he/she can predict certain results .These are given in sloka 92-98.

Table 5

Signs to look for	predictions
1dust or dhoolivarsha	Lack of food
2 neehaara	Fear of disease
3 earthquake	Death of great kings
4.meteor	Death of ministers
5.multicoloured clouds(fiery rainbow cloud as seen in May 2008 at Washington border)	fear

6.Meghagarjana	abortion s
7.vidyuthpaatha	Death of kings and carnivor es
8.parivesha	diseases
9digdaaha	Fear from kings and fire
10 strong rough winds	Fear of thiefs and deaths
11.nirghatha,indradhanus,dan dam(elongated Eros is danda)	Hunger in the other hemisph

	ere of earth
12 grahayudha	Wars between kings
13 kethu or comets	wars
14 Jalapaatha which is avikritha	Subhiks ha,If this is seen all the other bad effects are nullified .

In 1908 ,there was Tuguska fall in
Siberia in which meteors,meghagarjana,

vidhyuthpaatha and digdaaha was reported and the tsar emperors of Russia came to an end and there was revolutions of a bloody nature in Russia.

Varahamihira says if after lunar eclipse within a few days solar eclipse happens people become unethical and there is battles between man and wife.If 15 days after a solar eclipse a lunar eclipse happen vipraas and scholars get the effects of several krathu and people will be happy.

Chapter 11 is called Kethuchaara and it is a very important chapter and Varahamihira gives us the ancestor's views(Gargi,Parasara,Asitha,Devala etc)and of his own observatory results .He categorically states that one cannot calculate its rise and setting just by mathematical knowledge alone and careful observation for several years is

needed. There are three types of kethu, and they are divya, anthariksha and bhouma. He classifies everything except khadyotha (an insect which is bright at its tail end), light from phosphorous seen in cremation grounds from bones, asi or sword that shines and rathna (diamond) under the word kethu. Kethu is therefore a bright object other than these mentioned, and are seen in sky, anthariksha and earth. The anthariksha janya are seen as flags, weapons, house, tree, horse or elephant shapes. The kethu seen in and among the stars is divya kethu. Whatever is not these two are from earth and are called bhoumakethu. The scholars of Varahamihira's time were of different opinion about the classification of kethu. Some classified 111 types of kethu. Others described 1000 types of kethu. Naradamuni said

there is only one kethu and it is appearing in different forms.

Varahamihira says whichever is the number ,one has to know the rise and setting of a kethu,the position of it,sparsa and dhoomavarna and the effects there of .How many days the kethu was visible determines its duration of effects.After its setting,within 45 days the effects become visible.If kethu is small, beautiful,white and without tails,it is good and gives food in plenty .The opposite of these qualities gives the name dhoomakethu to it and if it is bent like a bow of Indra or with one or two tails it is bad for people.

Kethu that originate in sun is called kirana and have appearance of garland, gold or diamond and with 25 sikhaas seen in east or west direction and when it is seen there is enmity between kings.The

kethu seen as parrot, fire, hibiscus flower, laksha or blood is originating from agni and are of 25 types and when they are seen there is fear of fire. 25 Kethu in the south direction with vakrasikha and strong Krishna colour are born of Mrityu and people die when they are seen. There are 32 types of spherical golalike and darpanashaped kethu without sikha and with kirana and seen in eesaana direction as if filled with water and oily are from earth itself and when they arise people suffer from famines.

Three types of kethu in north direction seen with colour of moonray, silver, ice, jasmine flower are from moon and they give prosperity. There is a kethu called Brahmada which is single and can arise in any direction and is seen at the end of a yuga and has 3 sikha and 3 colours. These are the 111 kethus

described. The 899 kethus with their characters are then said.

In north and east from Venus 84 kethu -big, white starlike .

Any direction from Saturn 60 kethu with halo and 2 sikha called kanaka .

In southern direction 65 kethu without sikha and similar to a star and white are called Vikacha .

In any direction 51 kethus called thaskara from Mercury are not very distinct and are sookshma ,elongated and white

In north with 3 tails similar to a star are 60 kethus with red or agnivarna and are called kumkuma and are from Mars.

Thaamasakeelaka are 3 X 30 or 90 and are in Rahu and described in Chandra and Suryamandala .

120 kethus are seen as a garland of fire and called visaroota and they produce agnibhaya.

77 kethus are from vaayu and called aruna having syamaaruna colour and form of a chaamara without kirana

8 of the kethus are called ganaka and are sons of prajapathy and similar to taraapunja. 204 kethus are sons of Brahma. 32 are sons of varuna from water and called kamka and have the brightness of moon. 96 kethus are having shape of kabandha and called kabandha and are sons of kaala and some of them are stars.

White and broad and 9 in number are kethus in the vidisha. In this way 1000 kethus are described .

After talking about these general description Varahamihira speaks of some specific kethus . Like vasaakethu, sashtra,

kapaalakethu,roudrakethu,chalakethu,swethakethu which is in the shape of letter KA ,swetham, rasmikethu, dhruvakethu, kumudakethu,manikethu,jalakethu,Bhavakethu,Padmakethu,aavarthakethu,samvathakethu, are specially described with its characters and effects.Depending upon the star in which the kethu is seen different parts of India is affected according to varahamihira.

Aswini-Aswaka king
 Bharani-Kiraatha king
 Krithika-kalinga king
 Rohini –Soorasenapathy
 Mrigasira-Useenara
 Thiruvathira-Matsyaraja
 Punarvasu-Asmaka
 Pushya-Maghada
 Aslesha-Asikesa
 Magha-Angharaja
 Poora-Pandya

Uthra-Ujjain
 Hastha-Dandaka
 Visakha-Ikshawku and king of Rathnaka
 Anuradha-Pundra
 Jyeshtha-all emperors
 Moola-Andhraka and Madraka
 Poorvashada-kaasi
 Uthraashada-Yodha,Arjunaayana,sibi
 and Chedi
 Sravanam-kekayan
 Dhanishta-Panchanada
 Chathaya-simhalan
 Poorvabhadrapada-vanga
 Utharabhadrapada-Naimisaranya
 Revathy-Kirathadesa

If the sikha of kethu is bombarded with
 meteors it is prosperous and we get lot of
 rains but the chola, Avaghaana (AFghan)
 sitha,Huna and cheenadesa do not get
 rains and have famines.

What strikes us from the description and classification is the wide observation done by several rishis, and the codification of it by every new scientist in his/her work before speaking about his own observations and the fact that Varahamihira includes comets, meteors, meteorites, asteroids, fireballs, dark clouds, counter glow and glow as different aspects of one and the same phenomenon. The 4 classifications of Gargi, Parasara, Asitha and Devala and a unification theory of these 4 by Naarada is given before his observations are recorded.

Table 5 Classification of Gargi (This classification is used in Bhaagavatha puraanam also)

Divya	Anthariks ha	Bhouma
Originate from nakshathrapat ha beyond the solar system and become visible after long periods of invisibility	From solar system and planets other than earth ,and being visible from time to time due to the attraction of the sun and earth systems	Originating from earth itself and seen beneath the anthariksha or in vaayumanda la of earth

Table 6 Classification of Paraasara

Nam e	Nu mb er	ori gin	Dir ecti on	Colour	Effect
kiran a	25	su n	Eas t/an d wes t	Haara,mani, hemam	Hatre d and war
Agne yam	25	fir e		Parrotgreen, agni,laksha, blood	agnib haya
Vakr asikh a	25	mr ity u	sou th	Strong krishnavarn a	death
Visik ha	32	ear th	nor the ast	Oily or watery mirrorlike	Fami ne,hu nger
chaa ndra	3	mo on	nor th	Moonray,sil ver,ice,jasm ine	subhi ksha

Brah mada nda	1	Br ah ma	An y dire ctio n	3 colours,3 sikha	End of a yuga
Total	11 1				

Table 7 Classification of Asitha (896
kethus)

Na me	D ir ec ti o n	Or igi n	N u m b er	Form
Cha thur asee thy	N or th	Ve nu s	2 4	Big white starlike with 2 sikha

	,N E			
Kan aka	A n y di re ct io n	Sa tur n	6 0	Big bright white starlike with no sikha
Vik ach a	so ut h	Ju pit er	6 5	Big bright white starlike no sikha
Tha skar a	-	M er cu ry	5 1	Sookshma, indistinct, elo ngated, white
Ku mk uma	N or th	M ars	6 0	Red like fire with 3 tails like a star

Tha mas a and keel aka	S ol ar an d lu na r m an da la	Ra ah u/ ea rth	9 0	Serpent,fire,chaamara,k abandha,crow,chathra,d waja,tree,horse,elephant ,sphulinga,dhoomashap es-krishna,yellow,red and white colours
Vis war oop a	-	-	1 2	Like a garland of fire
Aru na	-	Va ay u	7 7	Shyaamaruna chaamara shapes
Gan aka	-	Pr aja	8	Tharaapunjasamaana

		pa th y		
Bra hma sant haa na	-	Br ah m a	2 0 4	-
Ka mka	-	Va ru na	3 2	chandrasamaana
Kab and ha	-	Ka ala	9 6	Chanda and stars with grotesque shapes
Vid isha	-	vi dis hi	9	White similar to stars

Table 8 varahamihira gives 16 kethus
observed and specifically named by him

Name	Direction of rising	Direction of setting	Vyaaptha in sky	Form
1.vasaa kethu	west	north	-	Mahat,snigdha no tail.
2.Sasthra	west	north	-	Rooksha,snigdha,kshudra
3.Kapala	east	-	-	Several rays and sikhis and in amavasya day
4.roudra	east	south	3/4 th of sky	Like sharp end of soola and with rooksha thamra varna

5.chala kethu	wes t	1 inc h abo ve sout h ,an d gro ws to nort h and sets in sout h itsel f	Touch saptha rshi and abhijit hmand ala	dhoomra
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6.Ka (the one seen when Christ was born was of this type)	east	See n in fron t of the sout her n dire ctio n	-	Snigdha,like a cross or KA in brahmi lipi seen in yuga end for 7 days in midnight
7 swetha kethu	-	-	3/4th	Shyama,and rooksha like a jata
8.rash miketh u	In Kar thik a star	-		Dhoomavarn a sikha

9.Dhruvakethu	Aniyatha	-	-	Snigdha no tail
10.kumudakethu	west	-	-	Sikha extend to east. Seen for one night
11.manikethu	west	-	-	Sookshma starlike, white, straight tiny sikha, seen only for one yaama
12.jalakethu	-	-	-	Several sikha on top and below snigdha described as a broom

13.pad maketh u	wes t	-	-	White like mrinaala,see n for one night
14.Bha vaketh u	-	-	-	One night only.frontlik e sookshmatha ara,snigdha, back like tail of lion tail extends to south.
15 Aavart ha	-	-	-	One side snighda,othe r savya sikha arunavarna,s een till half of night

16 samvar tha	wes t	-	3/4th	Dhoomatha mra colour,sikha like tip of soola,in sandhya
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Today we give names of people who discovered the comet or or of the year in which they were observed. These were not given much importance by the ancestors. They gave importance to the direction in which seen, where it sets and also the form and colour and presence or absence of the sikhi or tail and its character and the effects produced by each on which part of the world and so on and named the kethus on this basis, which has to be considered more scientific and of more social sense than

the current way of naming. The Ka kethu according to Varahamihira, if it is seen in yugaparivarthana time for 7 days the new era will be good and peaceful but if for 10 days the new era is made with armed revolutions and bloodshed and destructions and losses to all. Here I am enumerating some of the modern comets named and the associated meteorites with them, for completion and comparison sake.

Table 9. Modern comets and meteors associated with them

Comet	Meteor
1.1861-1	Lirids in vaisakha the most active
2.1910-11-Halley	Gaama aquarids (most active in vaisakha, jyeshta) orionids (as winam, kaarthikam)

3.1862- 111	Swift turtle perseids(sravaana)
4..1866 1.Tempe l	Leonids(karthika,agrahaaya na)
5.1951. V1 pons winneck e	Bootids(ashaada)
6.1946 V geakobin i sinner	Draconids(aswinam)
7.1911 11 KIES	Origids(bhaadram)
8.1852 111(beal a)	Andromedids(karthika,agraha ayana)
9.1954 1X Enkay	Torrids(aswina,karthika)

10.shoe maker levy (1994)	
11 hayakkut hakke	
12.Halib op (c/1995/ 01)	A jalakethu
13 Austin	A chalakethu

Table 10.Those coming from beyond Jupiters mandala

1.Lyrids	Lyre	Between Sravana,dhanishta near Abhijith
2.Orionids	orionis	Near rohini,Mrigasira and Ardra stars

3.Gama aquarids	Aquari scorpi	Sathabhisha Anuradha
4.Persids	Persi	
5.Leonids	Leonis	Magha,Poora, Near saptharshi

Table 11 Jovianfamily near Jupiter
influenced by Jupiter from time to time
with nearby starclusters

Name	Star	Equivalent in India
Andro medids Bootids Draconi ds	Andro mede Ursae majori s	Uthrabadrapaadam,Re vathy,Aswathy Swathy saptharshi

	Draco nis	
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Table 12 Near earths orbit with short revolutionary period

Name star equivalent

Virgeon id	Virgini s	Hastham,Chithra in Kanya
Delta aquarid s	Aquari	Dhanishta ,sathaabhisha
Scorpio nids	Sagitta rii	Moolam,Purvashada, Uthrashada
Jeminid s	Jemino rum	Mrigasira,Ardra and Sunkathaara (Sirius)inMithunaraas i

Synonym for kethu is sikhi which means hair or one with hair.In greek language

they coined the term Kometes (means with long hair) from this. According to Indian version lakhs of comets are there and about 1000-1007 are described by them. Western science has described and classified even lesser numbers. Sir Edmund Halley was the second Royal astronomer of Britain. He noticed in 1682 a comet and identified it as the same one which visited earth in 1607, 1531, 1456, 1378, 1301 and this was after England and its scholars came in contact with India and its astronomy as India became their colony. Always the colonizer wants to be greater than the colonized is a human behavioural pattern of power relations. Therefore when Edmond Halley wrote in 1705 “candid posterity will not refuse to acknowledge that this was first discovered by an Englishman “a little bit of inferiority

complex and a little bit of superiority complex are both in it. The phenomenon, classified, observed for centuries and described by several people in India thus became the private property of English astronomer Halley and the western astronomy has only 300 years history of observation of celestial phenomena whereas India has thousands of years of observation. The intellectual property rights are often determined by power and politics and property rights of sciences and arts including astronomy, medicine and music we have this problem still alive among us.

saptharshi and Koormavibhaaga

In chapter 13 saptharshichaaara sloka 3 Varahamihira says that during Yudhishtira's rule saptharshi was near Makha star cluster and if we add the

current saka era to 2526 we get the time of Yudhishtira. In AD 2008 saka era is 1930 and adding 2526 we get 4456 years back as Yudhishtira era. BC 2448 was the beginning of Yudhishtira saka started by Janamejaya .

The division of the nakshathra and corresponding regions is called Koorma vibhaaga and is the topic of 14th chapter of samhitha. There are 9 varga with 3 stars each. These begin from karthika star and Bharatha is divided from east in Pradakshinakarma as below.

1. Karthika, Rohini, Mrigasira (Mesha, Rishabha, Mithuna)
 Bhadram, Arimadam, Mandavyam, Saluam, Neepam, Ujjihaanam, Samkhyatham,, Maru, Vatsaghosham, Yamunam, saraswatham, matsyam, madhyamikam, Mathuram, Upajyothisham, Dharmaranyam, Soorasen

am,Souragreevam,Udhehikam,Paandugu
da,Aswathya,Paanchaala,Saaketha,Kamk
am,kuru,kaalakoty,kukuram,paariyathran
agam,oudumbaram,kapishthalam,hashtin
aadesam.

2.Thiruvathira,Punarvasu ,pushya
(mithuna and karkitaka)

In the east Anjana mountains,
rishabhadwaja, padma,Malyavan,
vyaghramukha,sukshma,karvata,chandra
pura,soorpakarna,khasa,maghada,sabarig
iri,Mithila,samathata,oudh,aswavadana,d
anthuraka,pragjyothisha.louhitya,ksheero
dhasamudra,purushadam,udayagiri,bhadr
agoudaka,poundra,utkala,kaasi,mekhala,
ambashta,ekapada,thamralipthika,kosala
ka,vardhamaana,

3.Aslesha,Makha,purva
(karkitaka,simha)

In agnikon,kosala,kalinga, vanga,
 upavanga, jatara,anga,souleeka,
 vidarbha, vatsa,Andhra, chedi,
 urdhwakhanda,vrisha,naalikera,charmad
 weepa,vindhyachalanikata,thripuri,smasr
 udhara,hemakuta,vyalagreeva,mahagreev
 a,kishkindha,kandakasthala,nishadarasht
 ra,puri,dasarna,nagrapana,sabara
 4.Uthra,Hastham,chithra(simha,and
 kanni)

In south
 Lanka,kaalajinam,soureekeerni(choornik
 aara)thaleekhata,girinagara,Malaya,dard
 ura,mahendra,marukatcham,kamkatam,ta
 mkanam,vanavasi,sibikam,phanikaaram,
 konkanam,aabheeram,aakaaram,vena,ava
 nthakam,dasapuram,gonardham,keralaka
 m,karnatakam,mahatavi,chithrakuta,nasi
 kyam,kolagiri,cholam,krounchadweepam

,jatadharam,kaveri,rishyamookam,Vaiduryasamkhamukthaakaradesam,Athryasramam,vaaricharam,Dharmapattanadweepam,ganarajyam,Krishna,velur,pisikam,soorpaadi,kusumanagaram,Thumbavanam,karmaneyakam,southern ocean, Thaapasaasramam, risheekam, kanchi, maruchipathanam, cheyam, aryakam, simh alam, rishabham, baladevapathanam, dand akavanam, Thimingalaasanam, Bhadrakat cham, kunjaradhari, Thamraparni.

5.Swathy,visakha,Anuradha(Thula and vrischika)

In nairyathi ,Palhava,kamboja, sindhu, souveera,Badavamukha,Agha,Ambashta, kapila,nareemukha,Anartha,Phenagiri,ya vana,maakara,karnapraveyam,parasaram, soodram,barbaram,kirathaghantam,kravy adam,abheeram,chamchukam,hemagiri,si

ndhukaalakam,Raivathakam,Surashtra,B
aadaram,Dravidaadidesa,Mahaarnavam.

6.Jyeshta,Moola,Purvabhadrapaada(Vris
chika,Dhanus)

In west

Maniman,Maghavan,vanougha,Ksurarpa
na,hasthagiri,aparanthaka,santheeka,haih
aya,prasasthaadi,vokanam,panchanadam,
ramatam,paaratham,thaarakshithy,jringh
am,vaisyam,kanakam,sakam,mlechadesa
which is nirmaryaadadesa.

7.Uthraashada,sravana,dhanishta(dhanus
,makara)

In northwest, mandavya, thusharagiri,
thalam,halam,madra,asmaka,kulutha,lah
ata,sthreerajya,nrisimhavana,khashta,ven
umathy,Phalgulaka,Guruha,Marukutsam,

charmarangam,ekavilochanam,sooleekam,deerghagreevam,aasyakesam.

8.Sathabhisha,purvabhadrapada,utharabhadrapadam(Kumbha,meena)

In north kailasa,Himavan, Vasuman,
Dhanushman,krouncha,merugiri,utharak
uru,kshudrameenam,kekayam,vasaathy,y
amunam,bhogaprastham,arjunaayanam,
Agneedram,aadarsam,anthadweepam,thri
gartham,thuragaananam,aswamukham,ke
sadharam,chipitanaasikam,daserakam,va
atadhaanam,saradhaanam,thakshasila,pus
hkalaavatham,kailavatham,kandadhaana
m,ambaram,bhadrakam,malwam,pourava
m,katcharam,danthapingalakam,maanam
,halam,human,kohalam,seethalam,manda
vyam,bhoothapuram,gandharam,yasova
thy,hemathalam,rajanyam,khacharam,ga

vyam,youdheyam,daasameyam,shyamak
am,kshemadhoortham.

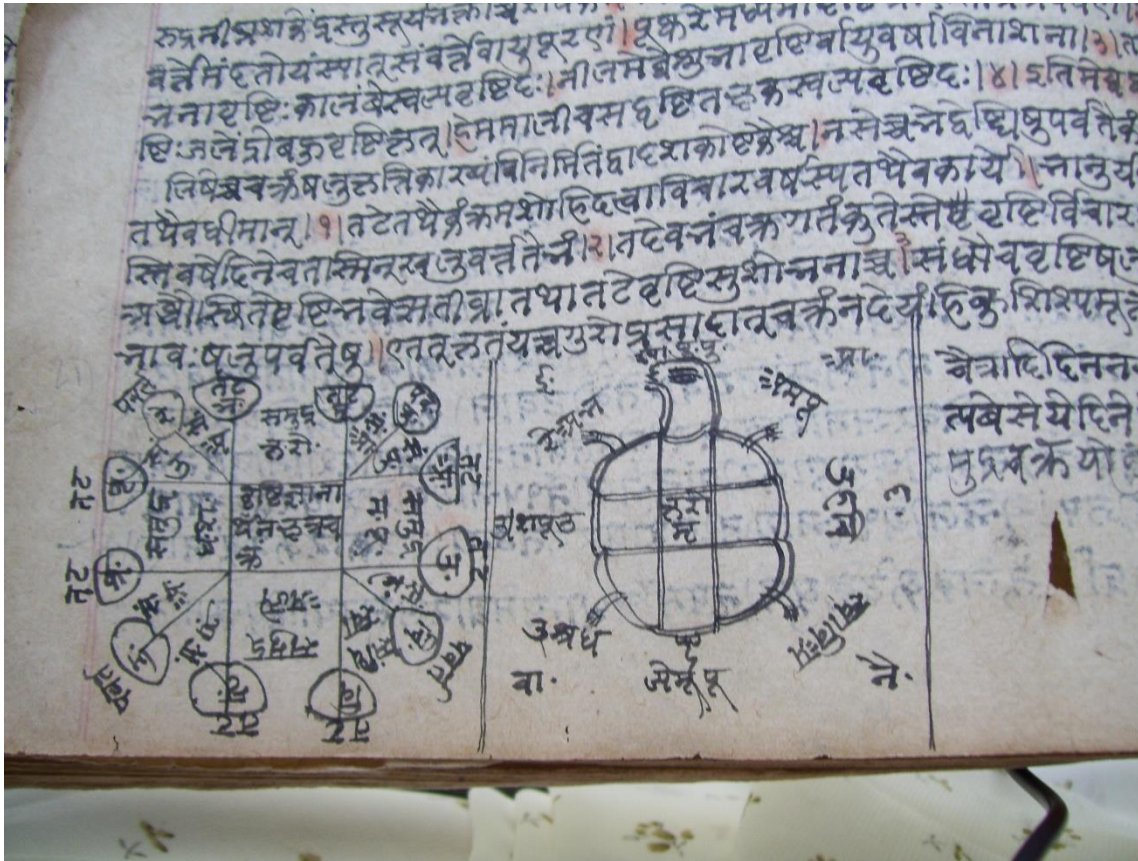
9.Revathy,Aswini,Bharani(Meena,Mesha
)

In Easanakon,merukam, nashtarajyam,
pasupaalam,keeram,kashmeram,abhisara
m,daradam,thanganam,kulutham,sairindh
ram,vanarashtram,brahmapuram,daarvad
aamaram,vanarajyam,kiratham,cheenam,
kounindam,bhallapam,lolajatam,surakun
atam,khasam,ghosham,kuchikam,ekacha
ranam,anuviswam,suvarnabhoo,vasuva
nam,divishtam,pouravam,chiranivasana
m,thrinethram,munjaadri,gaandharvam.

If grahapeda occur in the 9 nakshatra
starting from agneya,panchala, maghada,
kalinga,avanthy,aanartha,sindhusouveera

,haarahouram,bhadram,kounindam will have their rulers destroyed respectively.

Fig Koormachakra from
Gargapaasaavali (Manuscript in Adyar
Libray)



Koormavibhaagam is a type of mapmaking which was present in India from time immemorial. Not only the country and the globe but also the celestial sphere and biological body of human beings are mapped in the same way. koorma is a tetrahedron shape and a shell of tortoise divided into 9 parts. The tortoise shell is a hemisphere and divided into 8 directions or 8 divisions around and a central axis or meru part .This way of dividing a golakshethra was done by Manu to give 9 parts of the earth to his 9 sons. The loshu of china or lopamudra soothra of India also uses this method. Figure below shows the division and the extension to form rectangles and cubes. There are 72 faces for the cube. The point which takes 72.2 years to travel one degree takes 25992 or 26000 years to

cover a full circle of 360 degrees. This is called precision of equinox or ayanaamsa balancing. If we add the time of revolution of kranthibhedanabindu also, a point which travels 1 degree in 76 years, 27360 years needed for 360 degree. The mean of these two is 26676 or to make it even number roughly 27000 years. Which is 27 nakshathra X 1000 years also.

As I have mentioned earlier in Raaga chikitsa, the same principle is used in music, astronomy, medicine, philosophy, yoga and other disciplines by Indians and therefore it is not borrowed from any one else but an indigenous discovery of India.

2 Vararuchivaakya

In the preface to Varahamihira's Panchasidhanthika G.Thibaut says the determination of position of moon is different in Poulisasidhantha from the other four and in Poulisasidhantha and in Romakasidhantha the haaraka 3031 is used in the calculations and this is the part of vakyam padhathy used all over the Thamilspeaking countries of the Deccan for determination of longitude of moon and sun and this had been pointed out by Warren and Bailey. This Vaakyam padhathy of Deccan uses Thevaaram(248) within 248 days moon completes a cycle. Kaalaneela(3031) for 110 revolutions of moon, Rasagharika (12372) for 441 revolutions and in a

multiple of rasagharika which is called veda there is 1600984 days.

Ahargana/kaalaneela=balance divided by 3031 and the balance thereof with 248

.The balance thus obtained is used in the table for finding out position of moon and his movement. Warren called this as Chandravakyam dhoomravaahanam ,as known in Tamilspeaking countries. The chandravakya are said to be first made popular through the scholar Vararuchi and therefore they are also called vararuchivakya. Vararuchi is a scholar who was famous both in Ujjain and Kerala and his story of marrying a lowcaste woman and having 12 children from her and they being abandoned looked after by different castes of people and all of them living in harmony is a wellknown story in kerala and in fact all these families still exist in kerala. In 1948

C.KunjanRaja in Adyar Theosophical library (A.D1.Var 1.can1.serial no:81572.Acc dt 21.12.1948 PV 666) published Chandravakya of Vararuchi with a commentary to it according to the Panchabodha which is prevalent in Malabar.

The first solar month Mesha and the chandramaasa(lunar month)chaithra come together.Chandravarsha(lunar year)354 is 11 days less than the solar year (suryavarsha)365.Therefore in three years one adhimaasa(extramonth) happens.Sun stays in one star for 13 days and in 2 ½ stars for one month.In 27 stars 12 months.Whereas moon stays in one star just for one thithy .When a baby is born every woman and man in the house could determine the star, souramaasa, chaandramaasa, thithi, paksha etc in ancient Tamilspeaking part

of India,including Kerala.That is the position of sun,moon and lagna (earth) could be determined even by common man,not only by scholars.Astronomy was a household knowledge shows its antiquity . The addition,subtraction, multiplication and division were not done on paper but on a wooden rectangular piece(palaka)with cowrie shells and neither was it thought to be just for counting money,but for abstract knowledge.These show the brain development of a people as a whole.The relation of vakyam padhathi to akshara or letters deserves mention because of its relation to syntax and language which is another important point to think of in human development.The letters had values .The vyanjana after a swara,swara after a vyanjana ,visarga and anuswara had no value.

Following table gives the aksharamaala and the values for each letter.

1	2	3	4	5	6	7	8	9	10
k	kh	g	gh	ng	cha	chh	ja	jha	nj
a	a	a	a	a		a			a
ta	tah	d	dh	na	tha	thh	dh	dhh	na
		a	a			a	a	a	
p	ph	b	bh	ma					
a	a	a	a						
y	ra	la	va	sa	Sha	sa	ha	La	
a					ksh				
					a				

Every chandravakya is a soothravakya showing Thithi, Raasi and ili. For example Gheernashreya (3021) is 12/0/3 which is 12 Thithi, 0 raasi, 3 ili.

One thithi = 1/30 raasi

One ili = 1/60 thithi

*Amithayavolsukaheenam dhyuganam
rasaghairikai:kuleenaamghai:*

*Devendrainairapi hrithuaa thaschishtam
bhavathy vaakyasamkhyeno:*

Dhyuganam = kalidinasamkhyaya
Minus amithayavolsuka(1741650) from
it. Divide by rasaghairika(12372),
kuleenamgam(3031) and devendra(248) in
succession and the balance is the
vakyasamkhyaya of moon.

For January 15 th 1948 this was
calculated by Kunjan Raja as below:

Kalidina for the said date 1844100
1741650
= 102450/12372 = 8

balance 3774

3774/3031 = 1 balance 743
743/248 = 1 balance 195

195 is Maadhurya , the vakyasamkhyaya of
January 15 1948.

The table gives 195th chandravakya as bhaanu:sadya:syad .Which starts from Makara 1.Vakyapadhathi is for finding chandrasphuta in Parahithaganitha.Its bheejaganithasamskara is done from time to time by drigganitha(observation).But for ordinary calculation of a birthday or a utsava day in a temple just the chandravakya is enough.(Two different functions are there for a scholarly astronomer and for a common man with the same vaakya)

The table of chandravaakya of Vararuchi (chandravaakyani Vararuchikrithaani)for 248 days(thevaram or Devendra days)

Revolution 1 day 1	0-12-03
Gheerna:gneya:	0.24.09
Day 2 dhenava:shri:	1.0622
Day 3rudrasthu:namya:	1.18.44
Day 4bhavohi yajya	2.01.19
Day 5dhanyeyam naari	2.14.09

Day 6 dhanavaanputhra	02.27.1
Day 7 guhya sura rajna	3
Day 8baalena kulam	3.10.33
Day 9 dhanubhi :khalai	3.24.09
Day 10.dasasoonava	4.07.58
Day 11 homasyadhruva:	4.21.59
Day 12 deenasthe nrinaam	5.06.08
Day 13 mukham naareenaam	5.20.25
Day 14 bhavabhagnaasthe	6.04.44
Day 15 sreernidheeyathe	6.19.02
Day 16 sam kilanaatha:	7.03.15
Day 17 sreshtaasaa kathaa	7.17.22
Day 18 soukhysyaananda:	8.01.17
Day 19dhyaanam manyam hi	8.15.01
Day 20 dheerohi raja	8.28.29
Day 21 sruthyasya yudham	9.11.42
Day 22 abhavachadyam	9.24.40
Day 23 gorasonanusyath	10.07.2
Day 24 drumaa dhanya na ye	3
Day 25 ishtam raajna:kuryad	10.19.5
	2

Day 26 dhanya vidhyeyam syad	11.02.1 0
Day 27 thwam raksha rajyasya	11.14.1 9 11.26.2 4
Revolution 2	
Day 28 Kshethragna:	0.8.26
29 neele nether	0.20.30
30 jalam praagnaaya	1.02.38
31 sasi:vandha:syad	1.14.55
32 gorasapriya	1.27.23
33 vananiyathra	2.10.04
34 annam gothrashree	2.23.00
35 rushtasthe naaga:	3.06.12
36 dhighanda:kila	3.19.39
37 purogaa abhi:	4.03.21
38 manya:sakavi:	4.17.15
39 arishtanasam	5.01.20
40 baalome kasha:	5.15.33
41 kusadhaarina:	5.29.51

42	thushtir vidhyathe	6.14.70
43	sa raajaa preeth:	6.28.27
44	sugupraayosou	7.12.37
45	digasthuhraasa:	7.26.39
46	amgaaniyadaa	8.10.30
47	senaavan raja	8.24.07
48	dheeraa:sannadha:	9.07.29
49	saaleenam pradhaanam	09.20.3
50	ksheeram gornnonayeth	5
51	rathnachayo nripa:	10.03.2
52	thaa:prajaa:praagnaa:sya	6
	:	10.16.0
53	aswaanam ko yogya:	2
54	thaddwairam	10.28.2
	priyaayaam	6
		11.10.4
		0
		11.22.4
		6
Revolution 3		

55	Dhavathwam	0.4.49
56	Graamasthasya	0.16.52
57	Janmajara	0.28.58
58	Ishtakaa kaarya	1.11.10
59	Kulaguru:syad	1.23.31
60	Munistha ugra:	2.06.05
61	Pramodakara:	2.10.52
62	Sasaankaanugaa:	3.01.55
63	Vakshyaami kaalam	3.15.14
64	Sambheda:khalai:	3.28.47
65	Seelapriyasthwam	4.12.35
66	Velaathakha:	4.26.34
67	Vibhinnam karma:	5.10.44
68	Dharmavaan raama:	5.24.59
69	Dig vyaalo naasthi:	6.09.18
70	The baala braantha:	6.23.36
71	Kaamaasanna sa:	7.07.57
72	Homam puthraartham	7.21.58
73	Manirmarnnida:	8.05.55
74	Naavidha:paade:	8.19.40
75	Utpalam nidhi:	9.03.10

76 Soodrasthu yodha:	9.16.25
77 Virudham sthreedhanam	09.29.2
78 Heenapraayo nata:	4
79 Dhisascha:khinnoyam	10.12.0
80 Disathuna pathyam	8
81 Janondha:paapaka:	10.24.3
	9
	11.06.5
	8
	11.19.0
	8
Revolution 4	
82 Grihyasyad	0.1.13
83 Manyam loke	0.13.15
84 Dhanya:धारai:	0.25.19
85 Sukheesa nityam	1.07.27
86 Labho dhaanyasya	1.19.43
87 Amguram there	2.02.10
88 Dhaavadhyaidhyothra	2.14.49
89 Gathwa surashtram	2.27.43
90 Gamanakaalam	3.10.53

91	Dayaavaan rogee	3.24.18
92	Homasthaanam vanam	04.07.5
93	Sreemaan puthro vaa	8
94	Than mama naama	4.21.52
95	Daanaanaam karma:	5.05.56
96	Kshethravaanasthu:	5.20.08
97	Sambhurjayathi	6.04.26
98	Rathamganaartha	6.18.45
99	Lakshyosou paartha:	7.03.02
100	Saapathyaninda:	7.17.13
101	Jano maanyohi	8.01.17
102	Sa vaadi raajaa	8.15.08
103	Aakaaro yudham	8.28.47
104	Daasyaami sraadham	9.12.10
105	Kaaryahaanir naarya:	9.25.18
106	Dambhaannara:nashta:	10.08.1
107	Vikulaanaam karya:	1
108	Haranam padyasya	10.20.4
109	Thulaasampratyaya:	8
		11.03.1
		4

	11.15.2 8 11.27.3 6
Revolution 5	
110Dighandha:	0.9.39
111Kavi:puthra:	0.21.41
112Thathwanganeyam	1.03.46
113Jeernome kaaya:	1.15.58
114Bhayaa harasya:	1.28.18
115Asanapara:	2.10.50
116Thalu lekhothra	2.23.36
117Samgatho naaga:	3.06.37
118Visudho yogi:	3.19.54
119Tharaangam nabha:	4.03.26
120Priyaartham kavi:	4.17.12
121Paapoyam nishi	5.01.11
122Dhanyo maanyomse	5.15.19
123Bhoghaardham Raama	5.29.34
124Raamaa geeyathe	6.13.52
125Athyaaahaarasthu	6.28.10

126Saareerakou sou:	7.12.25
127Lolachakrastha:	7.26.33
128Praaganishpadam	8.10.32
129Divyavaan raja:	8.24.18
130Amsaarthinor dhe:	9.07.50
131Senaayaam krodha:	9.21.07
132Daanam bhaanor nashtam	10.04.0 8
133Bhoomistasya nityam	10.16.5
134Chakraadyam praagnaaya:	4 10.29.2
135Thaa bhaarya paapoyam	6
136Disombaraanasya:	11.11.4 6 11.23.5 8
Revolution 6	
137Glowrnaasthi	0.6.09
138Meenajeyam	0.18.05
139Daanaani nityam	1.00.08
140Thapa:sreya:syad:	1.12.16

141Ambudirishtai:	1.24.30
142Kshamaasthu narai:	2.06.56
143Loladhee puthra:	2.19.33
144The roudraa naagaa:	3.02.26
145Vilomakulam	3.15.34
146Sa mando raagee	3.28.57
147Thailapriyasthwam	4.12.36
148Sampratham ravi	4.26.17
149Kulinaam karma:	5.10.31
150Sruthwaa swaraani	5.24.42
151Dharmo daanam thu	6.28.59
152Dhooshyam gothram the	6.23.18
153Thulaarthinorthi	7.07.36
154Jithwasya ratha:	7.21.48
155Sramano nindaa:	8.05.52
156Shadwidaanyaahu:	8.19.46
157Thathragornidhi:	9.03.26
158Kesaasthe kaalaa:	9.16.51
159Yaanaani nonayen	10.00.0
160Sisire paaneeyam	1
161Bhogamaathram nityam	

162Yoonam daanam pathyam	10.12.5 5
163Sathwena sreya:syad	10.25.3 4 11.08.0 1 11.20.1 7
Revolution 7	
164Mukhe sree:	0.2.25
165Dhaaraa vrishty	0.14.29
166Palitham raagna:	0.26.31
167Thailajaanaarya:	1.08.36
168Thaabhiraaraasyu:	1.20.46
169Meenalagnothra:	2.03.05
170Thaalumadhye shree	2.15.36
171Gograadaaraaaa raagnaa:	02.28.2
172Dhanyasyaad kaala;	0
173Vargathwam khalai	3.11,09
174Gnaano deeno vaa	3.24.34

175Dhavaa:kaarava:	4.08.04
176Ksobha:sanai:sanai:	4.21.49
177Gosudhi kaama:	05.05.4
178Deeno vo gnaathy	6
179Thathra deeyathe	5.19.53
180Sobhaa ragna:sena:	6.04.08
181Agnaa sadhyaaa sa	6.18.26
182Natasya nanda:	07.02.4
183Dhanesoyam jana:	5
184Sa mando hrida:	7.17.00
185Nagaro yudha:	8.01.10
186Dheevasa:krodha:	8.15.09
187Sramo deeno nityam	8.28.57
188Dhooleesya braagnoyam	9.12.30
189Baahyavane yogyam	9.25.49
190Vigathapaapoyam	10.08.5
191Thaavadathra kaarya:	2
	10.21.3
	9
	11.04.1
	3

		11.11.3 4 11.28.4 6
Revolution 8		
192.	Graamo nashta:	0.10.52
193	saseeraathrow	0.22.55
194	Du:subhaa nashta:	1.04.58
195	Bhaanu:sadya:syad	1.17.04
196	Dayaardham sreya:	1.29.18
197	Prabhaayaa puthra:	2.11.42
198	Haryaswa:sreshta:	2.24.18
199	dhanu:senaamgam	3.07.09
200	sakyagnoo Raagee	3.20.15
201	Salilam navam	4.03.37
202	vaidya:sa kavi:	4.17.44
203	Menakaa naamaa	5.01.05
204	sena madhyamaa	5.15.07
205	Samyudha karma:	5.29.17
206	Swargalokosthi	6.13.34
207	gunaarthee rathy	6.27.53

208	Kavyapriyosou:	7.12.11
209	Bhadratharorthy	7.26.24
210	Dhyuragna paade	8.10.29
211	Gururvarada:	8.24.23
212	Maanado nidi	9.08.05
213	Rangasya sradha:	9.21.32
214	swabhavo gnaanasya:	10.04.4
215	Avastheyam naarya:	4
216	puthro	10.17.4
	gnaanaadyoyam	0
217	dhavasreya pathyam	11.00.2
218	Thenasarai:patu:	1
		11.12.4
		9
		11.25.0
		6
Revolution 9		
219	Vaidyosou:	0.7.14
220	Hayo dhanya:	0.19.18
221	Apriyonaye	1.01.20
222	Saasthrabaahyoyam	1.13.25

223	Bhogamaasrasya	1.25.34
224	Graamaarthee nara:	2.07.52
225	Yathraannam sreshtam	2.20.21
226	Bhinnangho naaga:	3.03.04
227	Pragnaatho yogi	3.16.02
228	Mukhyo dheero neela:	03.29.1
229	Gaava:priyaava:	5
230	Suratham thribhi:	4.12.43
231	Thriraagnaam kusa:	4.26.27
232	Dhaaraadhi :srama:	5.10.22
233	Thribhir haanisthe	5.24.29
234	Anamgaasritha:	6.08.42
235	Dhanya:sa:naatha:	6.23.00
236	Thilasya:rasa:	7.07.19
237	Thava maanada:	7.21.36
238	Shadwidam padam	8.05.46
239	Mangalam neelam	8.19.46
240	Yogya samyudhe:	9.03.35
241	Yogo gnaanina:syad	9,17.11
242	Sailaalayo namya:	10.00.3
		1

243 Manthritham pragnaaya:	10.13.3 5
244 Anidhaanam kape:	10.26.2
245 Srothreeya priyasya	5 11.09.0 0 11.21.2 2
246 Mangalam	0.3.35
247 Kave :sakyam	0.15.41
248 Bhaveth sukham	0.27.44

The above table is for 9
upachakrabrahana+ 3 nakshathra.
nakshathra=3273.60=3274 degree (13
.20 x 248)There are 248 days in 9
upachakrabrahana.To see the difference
between Thithy and nakshathra add
dhruvasamkhyā to the vakya.
Method of calculating Dhruvasamkhyā

Vividham nijavasurodham
thaapenohyam kulatham naipunyam
Dhigaharalaghusathronam chaithaan
haaraahrithai:phalai:kramasa:
Hathwa theshaam
yoga:koulatabhoopaalathanayasamyuk
tha
Desaantharavighateehatharathnapraay
aanwithodhruvo gneya:

Vividham nijavasurodham=927480944
 Thaapenohyam kulatham naipunyam=
 1107311016

Dhigaharalaghusathram=027232839

Write these from left in 5 columns as
 raasi,thithi,ili,vili,thalara(1/60 vili)The
 lowest number should come on the
 right side.These are multiplied by the
 result obtained earlier with the
 slokakriya of Amithayavothsu and if
 raasi is more than 12,reduce multiples

of 12 and the remaining is raasi position. To this add koulatabhoopaalathanaya(106314131) To this add Rathnapraaya(1202)and multiply by desantharavighatika .The result is dhruva.

The result obtained for amithayavotsava earlier is 8-1-1
Therefore the calculation here is
9-27-48-09-44X8
11-07-31-10-16X1
0-27-43-28-39 X1

Total
19-17-39-56-47
7-17-39-56-47
1-06-31-41-31

8.24.11-38-18+
3-00-30
8.24.14.38.48

Therefore Dhruva is 8.24.15
(Desaantharam 15X12.02 is 3.00.30)

If we do these two kriya for a said date
(here for **May 6th 1946**) on kalidina
1843482 it will be like this

1843482-

1741650

Result $101832/12372=8$ remaining
2856

Divided by 3031 Result 0 remainder
2156

Divided by 248 Result 11 and
remainder 28 Vakyasamkhyā for 28 is
Hari.

Chandravakyam for it **kshethragna:**
Dhruva is **Kaviraani**

9-27-48-09-44X8

11.07-31-10-16-X0

0-27-43-28-39-X11

Rasi	thithi	ili	vili	thalpara
0	6	24	12	52
0	0	0	0	0
0	12	53	8	9
Total				
0	18	77	20	61
1	4	17	21	1+
		2	00	20

(desanthara10X12.02)

Dhruva 1.4.20

Ka vi ra ni

1 4 2 0

Vararuchivakya is kshethragna

Nakshathragananam

Vakyadhruvaikyam hridayasphutendu

The vakyasamkhyā for January 15

1948 was 195th

Bhanu:sadya:syad.which is 1.17.04.To
this add suko varada(8.24.15)the

dhruva. The result is 10.11.19. To this the aharmaana of makararaasi (11 ili) is added so that it become 10.11.30. This is chandrasphuta for Makara first day in sunrise. 10 Raasi means 22 nakshathra over and it is the 23rd or Dhanishta. The mean Madhyamika sthithy between two nakshathraas or the chandrasthithi in the sunset between two sunrises

Bhaanusadsyaad 1.17.04

Du:subha:nashta: 1.04.58(previous day)

Dayaardasreya: 1.29.18(next day)

Madhyamikasthithy

1.16.08(chandrasphuta for sunrise of Makara)

1.04.58-

1.17.04

Ans:1.11.1 The madhyamikasthithy or the chandrasphuta for last day of Dhanu in sunset.

Table for Aharmaana

Rasi	Fir st 10 da ys 1- 10	Seco nd 10 days 11- 20	T he re st 20 -	Aharmaana vakya
Mesha/Thu la	1	1	2	Tayopuraa
Rishbha/vri schika	4	6	7	Bharthaasa a
Mithuna/D hanu	9	10	10	Danadyo nripa;
Karkitaka/ Makara	11	11	11	Patukapinit yam

Simha/kumbha	10	9	7	Nindyadhe e:sa:
Kanni/Meenam	6	5	3	Thanmoolam

From Kanni to 6 months the samkhyā is to be added and from Meenam to 6 months has to be subtracted.

Thithigananam

The difference between sun and moon is thithy. The position of sun is to be subtracted from position of moon. On Makara 1, January 15th 1948 sun has covered 9 rasi and 1.50 PM 15 ghatika 28 vighatika after sunrise of the previous day and samkramam 42 ili 32 vili which is more than half and therefore 32 vili = 1 ili is taken so that in Makara 43 ili is samkramam and sun's position in Makara 9.0.43

To this add yogyaadi/yogya(11).The table for finding Yogyadi is as below:

Rasi	1-8 days	9-17 days	18-24 days	Rest of days
Mesha	Yog yo 11	Vaidy a 14	Thapa: 16	Sathay am 17
Rishab ha	Dhan ya 19	Puthra 21	Swaro 22	Vara 24
Mithu na	Veer a 24	Soora 25	Saro 25	Vajri 24
Karkit aka	Bhad ra 24	Gothr o 23	Ruru 22	Kari 21
Simha	Dhan ya 19	Sevyo 17	Mayaa 15	Loko 13
Kanni	Kayo 11	Deena 8	Sthana am6	Ganaa 5
Thula	Yagn o 1	Yagna am 1	Gana 3	Soona 5
Vrisch ika	Sthe no 6	Deeno 8	Dhunir 9	Nnada 10

Dhanu	Aapa 10	Paapa 11	Paya 11	Pathya mm 11
Makar a	Pooj yo 11	Dhen o 9	Dino 8	Rthina 7
Kumb ha	Than ur 6	Bhinn a 4	Swana 2	Gnaani 0
Meena	Rath na 2	Bhaan u 4	Sunir 7	Nnaye 10

From Meena ,reduce for 6 months and from Kanni increase for 6 months.

Divide a month into 4,the first 8 days, the second 9-16,third 17-24,and fourth the rest of days.In table using the vakya for Makara 11.9.8.7 and since it is Makaram first date add 11.If 8 days have 11 the mean gathi is $1 \frac{3}{8}$.

9.0.43+0.0. 1(removing $\frac{3}{8}$ from the above)

Ans:9.0.44

In that rasi if sun stays less than half a day, we need not add this. The samkhyā without addition itself is sphutam. If more than $\frac{1}{2}$ day we have to add.

Chandrasthaanam 10.11.30

Suryasthaanam 9. 0.44

Difference 1.10.46

Samkramadhruvam

The first day on which sun enters the first rasi

*Sakaabdasaasthrarthavadhaat
thitheese naaptham dinaadyam
kalinaasapunyai:*

*Gurvaksharaadyai :sahitham
suraashtram*

*vivaswatha:samkramanadhruvam syad
sakavarshamX saasthrartham/thitheesa
saasthrartham is 725
thitheesa is 576*

su is 7.

Sakavarsha X 725/576

Answer divided by 7 and balance multiplied by 576 ,the phala is ghatika.

Repeat the process ,to get vighatika.

1/60 of it is Guruaksharam.Add to it kalinaasapunya(115031)

For example for saka year 1869

$1869 + 725 = 6355025/576$

Ans 2352 and balance 273

$2352/7 = 336$ No balance

$273 \times 60 = 16380/576 = 28$ balance 252 X

$60 / 576 = 26$ balance 144 X $60/576 = 15$

0.28.26.15+

11.50.31

Ans:0.40.16.46

Therefor samkramadhruva is as follows

Day ghati vighati Guruakshara

0 40 16 46

Samkramakaala

Samkraanthivaakyaniyuthadhruvaani

Samkraanthikaale ravivaasaraasya

To samkramadhruva samkraanthivakya
of that particular month is added to get
the samkraanthikaala of surya.

	Day
ghati vighati guruakshara	
Samkramadhruva	0
40 16 46	
Samkraanthivakya	2
39 17 47	
Is sarvasainyardhagaathram	
Samkramam	3
19 34 33	

If dinam is zero it is a Sunday.If 3,it is
a Wednesday and so on.Here ,After

sunrise on a Wednesday, 19 ghatika, 34 vighatika, in 0 longitude suryasamkramam. For every 4 minutes to the front and back (to east and west) difference has to be calculated depending on the longitude. 0 degree is Lanka for Indian astronomers.

Table of samkranthivaakya are given below.

Samkraanthivaakya

Month	Samkranthi vakya	D a y	G h a t i	Vi gh a t i	Guru aksh ara
Mesha/ rishaba	Lokaanam lakshmanaa gre	2	5 5	30	13
Rishab ha/Mith una	Vibhagabud hapathou	6	1 9	33	44

Mithun a/Karki	dhoorvidhos armasheegr am	2	5 5	59	49
Karki/s imha	Dhanyastha nnoudharakt haan	6	2 4	6	19
Simha/ kanni	Jayadhanus hiswaraan	2	2 6	9	18
Kanni/t hula	lolaghandaa mbhusobhai	4	5 3	32	33
Thula/v rischika	Dasraatbhit hwasibhisth ai	6	4 7	44	28
Vrischi k/dhan u	Viganayaha yapaan	1	1 8	15	34
Dhanu/ makara	Sarvasainya rdhagaathra an	2	3 9	17	47

Makara /kumbh a	Gouraamku rveethanorv ee	4	0 6	41	23
Kumbh a/meen a	Sthagayakri samamum	5	5 5	11	37
Meena/ mesha	Mushtikam baanakootai	1	1 5	31	15

Table for calculation of day and
Ghatika alone(easy method)

Month	Vakyam	Da y	Ghatik a
Mesha/rishbha	Thimire	2	56
Rishabha/mithu na	Niratha m	6	20
Mithuna/karkit aka	Chamare	2	56
Karkitaka/simh a	Marutha	6	25

Simha/kanni	Suraraat	2	27
Kanni/thula	Dhrinibha	4	54
Thula/vrischika	Javako	6	48
Vrischika/dhanu	Ghataka	1	19
Dhanu/makara	Nrivarata	2	40
Makara/kumbha	Sanibha	4	07
Kumbha/meena	Manimaana	5	55
Meena/mesha	Chayaka	1	16

Desantharavighatika is akshamsa. It is seen with help of sankuchaaya .In the same akshamsa(latitude)the length of day and night vary in different months and this was explained right from the day of Paithamahasidhantha as

explained in Panchasidhanthika. It is for samskaara of this that we use aharmaana vakya. On samaraathra day noon, the latitude of the equator determined by sankuchaaya measurement is called niraksha akshamsa. As for Indian subcontinent the nearest landmass of it in the vicinity of the equator being Lanka , Lanka is taken as nirakshaakshamsa. The science of this has to be understood first. The importance of Ujjain is that it is 24 degree akshamsa north of this exactly in tropic of cancer. So a imaginary line going through Lanka and another going through Ujjain marks the equator and the tropic of cancer. These two reference points are taken by all astronomers of yore for their calculations itself show their scientific

mind. As we ascend to the north hemisphere the shadow increases and in this way ,Greenich is more to the north of tropic of cancer line and scientifically not suited for taking as 0 degree .But political power equations made it so,when India became a British colony and the colonizer took the privilege of such a change to be made from Lanka and Ujjain to Greenige. The fact that in any place on earths surface if you fix a sanku of just 12 angula you can measure the chaaya and know the principle for that locality is made use of in this.

1/60 angula is called a vyangula.

Palaangula calculation

Vishuvaddinamadhyahne

bhaanghulavyamgulaathmikaa

Dwaadasaangulaa sanghutha

swadeshe palabhaamathaa

The chaya of sanku on a vishuvat day is multiplied by 52 and the desanthara praana thus obtained is divided by 6 to get desantharavighatika. The 8 important places in Malabar and their palaanghula (from Thiruvananthapuram to Perumchellur) are known in Kerala to be important for calculations.

Table of Palanghula for Kerala

Place	Vaakya	Ang ula	Vyang ula
Thiruvanantha puram	Sivaaya	1	45
Kollam	Vaani jya	1	54
Thiruvalla	Aghnee dra	2	00
Kodungallur	Dhanen dra	2	09

Peruvanam	Rajyasree	2	12
Thrissivaperur	Gopura	2	13
Alathoor	Dushkara	2	18
Perumchellur	Bhogendra	2	34

For 2 kaatham(4 miles)a vyamghula increases.The calculation between kollam and Thiruvalla is correct here, but is not correct between Thiruvananthapuram and kollam.That is,beyond kollam ,people of Thiruvananthapuram were not that scholarly and did not measure their palaanghula accurately.

Desantharavighatika in Trichur is 18.

The difference between Thiruvananthapuram and Perumchellur is 18 vyanghulam and between Thiruvananthapuram and Thrissur it is

3 vyanghulam difference. As we ascend from equator the difference increases. Rekhanasa (longitude) depending on east /west is dhana/rina(+/-)

Kalidinaganana

Abde kale

rardhajaganthupendrainhathwaa

Thato laasaghareedyahenaath

Eeshachamaaptham

gathamaasavakyagathahayuktham

Dhyuganochavaaraath

Ardhajaganthupendra(2103890)

Laasagaredya(12373)

Eeshachama(5760)

Multiply kalivarsha by 2103890, minus 12373, divide by 5760 and to the result the vakya for each month and the already lapsed days are added. From the day of krishnaa's swargaarohana

(according to others after mahaaprasthaana of yudhishtira) on a Friday is obtained. This can be checked by dividing the balance by 7 and applying to Friday.

Kali 5048X 2103890-
12373/5760=1843823

Dhanu has vakyam 276 or
thathaadri. adding which we get
1844099

In Makara zero days over. Therefore
1844099 is for Makaram 1st of 1948.

Table of Vakya for months

Mont h	Vakya	Samk hya	Prathimaasas amkhya
Mesh a	Kuleena	031	31
Risha bha	Rooksh agna	062	31

Mithu na	Vidhaan a	094	32
Karkit aka	Maathra yaa	125	31
Simha	Kshanas ya	156	31
Kanni	Simhas ya	187	31
Thula	Suputhr a	217	30
Vrisc hika	Chathw arat	246	29
Dhan u	Thathaa dri	276	30
Makar a	Meena mghi	305	29
Kumb ha	Mrigaaa nghi	335	30
Meen a	Maathul a	365	30

One day is 60 ghatika
 1 ghatika is 60 vighatika
 9 nakshatra is 4 raasi or 120
 degree. Such 3 combinations make 360
 degree. So for 3 stars the same value
 comes. And the table for 9 stars
 becomes the table for all 27 stars as
 given in Varahamihira's
 Panchasidhanthika and this was not
 understood by Thibaut, the
 commentator as I have pointed out
 from his preface to Panchasidhanthika
 . In other words if we know the sine and
 cosine for 9 stars we know the sine and
 cosine of the entire zodiac.
 Table of 9 starclusters as 3 each

Star	Month	From To

1.Aswini/Makham/ Moolam	Mesha/Simh a/Dhanu	0 13. 20
2.Bharani/Poora/Po orashada	same	13. 21 26. 40
3.Karthika/Uthara/ Uthrashada	Mesha/risha bha Simha/kanni Dhanu/maka ra	26- 41 40
4Rohini /Hastha/Sravana	Rishabha/K anni/Makara	40 53. 20
5Mrigaseersa/chitra /dhanishta	Mithuna/thu la/kumbha	53. 21 66. 20

6Ardra/swathy/sath abhisha	same	66. 21 80
7Punarvasu/visakha /Purvabhadrapada	Mithuna/kar ki Thula/vrisch ika Kumbha/me ena	81- 93. 20
8Pushya/anuradha/ Uthrabhadrapada	Karki/vrisch ika/meena	93. 21 10 6.4 0
9.aslesha /jyeshta/Revathy	same	10 6.4 1 12 0

Table of Raasimaana

Ras i	Nakshatra	Vak ya	Gh ati ka	Vig hati ka
Me sha Ris hab ha Mit hun a Kar kita ka	Aswathi/Bharani/ Karthika1/4 Karthika3/4,rohini ,Mrigasira1/2 Mrigasira1/2,ardra ,punarvasu3/4 Punarvasu1/4,pus hya/aslesha	Raa gaab ha Sen esa Dha resa Rou drini	4 5 5 5	32 07 29 22
Si mh a Ka nni	Makha,pushya,Ut hra1/4 Uthra3/4,hashta,c hithra1/2 Chithra1/2,swathy ,visakha3/4	Lag nesa He mab ha	5 4 5 5	03 58 11 29

Th ula Vri sch ika	Visakha1/4,anura dha,jyeshta	Pute sa Dha aran a		
Dh anu Ma kar a Ku mb ha Me ena	Moola,purvashada ,uthrashada1/4 Uthrashada3/4,sra vana,dhanishta1/2 Dhanishta1/2,sath abhisa,purvabhadra pada3/4 Poorvabhadrapada 1/4,uthrabhadrapa da,revathy	Gou rees a Kris hna ba Pura abha bha gya vaan	5 4 4 5	23 51 21 14

There are two types of Nakshathra vakya in use in India. One is that of

Purushothama which is not very popular but is very accurate. the other one which is very popular, easy and used widely in Kerala is given by C.Kunjan raja as below:

Table of Nakshatravakya

Star	Vakya	R a s i	G h a t i k a	1/ 8 g h a t i k a	R a s i	G h a t i k a	1/4 g h a t i k a	Va k y a
Srava na	priyo gni	0	1	2	0	1	2	priy ogn i
Dhani shta	khala nam	0	3	2	0	3	3	kha laa na m
Satha bhisha	yuva ayam	1	4	1	1	1	2	priy aay

								aa m
Poorv abhad rapad a	sabha agya	1	4	7	2	0	0	nan aad i
Uthra bhadra pada	puraa rou	2	2	1	2	2	3	gur ush ree
Revat hy	kune ela	3	0	1	3	0	0	nan eela
Aswin i	Patol i	3	1	1	3	2	1	pur aag ou
Bhara ni	Bida ala	3	3	3	3	5	0	na ma arg am
Karthi ka	Vana abha	4	0	4	4	1	0	nat ova a

Rohin i	Vira mbha	4	2	4	4	3	0	nag ova a
Mriga sira	Nrina ama	5	0	0	5	0	1	Pun arm e
Ardra	Suna ama	5	0	7	5	1	2	Pri yes a
Punar vasu	Vine etha	6	0	4	6	0	1	Pun asth e
Pushy a	Sura kshi	9	2	7	6	2	2	Kh uga rthy
Asles ha	Vilak sha	6	3	4	6	5	0	Na mas the

Makh a	Priyo sou	7	1	2	7	1	2	Pri yos ou
Poora m	Niva asi	7	4	0	7	4	0	Na vaa saa
Uthra m	ninaa di	8	0	0	8	0	2	Pra nin daa
Hasth am	ksha paah e	8	1	6	8	3	3	Bal eha a
Chithr a	nava abhi	8	4	0	8	5	1	Ku naa di
Swath y	sthan aagh e	9	0	6	9	1	2	Pri yob di
Visak ham	khala abdo u	9	3	2	9	5	0	Nri me dha

Anura dham	gane enity a	1 0	0	3	1 0	1	2	Pra nin ye
Jyesht a	vidhy aana ye	1 0	1	4	1 0	1	1	Paa taa nye
Moola m	saam bana avya m	1 0	3	7	1 0	4	1	Ya vaa nye
Poorv ashad am	Thap opaa ya	1 1	1	6	1 1	1	1	Ku paa kye
Uthra shada m	Yoga vyay e	1 1	3	1	1 1	3	2	Pra gop ye

Table of dinamaana from
Chaayadairghya

R as i	1	2	3	4	5	6	7	8	9	1 0	1 1	1 2	1 3	1 4	1 5	1 6
Si m h a/ M es h a	V r i s h a 6 4	R a n g e 3 2	P a r a 2 1	S u k o 1 5	R a k a 1 2	B u d h a 9 . 1 3	V a s h u 7 . 4 1	P a t h i 6 . 0 1	N a m a b h o t h 4 . 0	N a l r a i y i n a 0 . 3 5	K i r a y i n a 0 . 3 5	G a t h a n a m 0 . 6	S a h a n a m 0 . 6	G a n a m 0 . 6	N o n a m 0 . 6	
R is h a b h	S u t h a 3 3	B a l t h a 3 3	R a t h a p a p y	T h a p a p y	P r a h i j a	S u n t h a 6	R a n t h a 6	S a m v a i g u s h a	G a h a r i k p y a 1 1	B a r i k p y a 1 1	T h a p y a 1 1	P r a h i j a	M u k p y a 1 1	R u p y a 1 1	N a p y a 1 1	

a/ k ar ki	6 7		u 2 2	1 6	a m 1 2	. 5 0	8 . 7 0	. 5 3	. 3 4	. 6 2	a 1 . 2 5	1 . 2 0	. 2 0	. 2 0	
M it h u n a	D h o r t a 6 . 9	B r i o g h u 3 2 4	K r o o r a 2 . 2	C h a p a 1 . 3 5	G o p e 1 . 0	N a t j e 8 . 2 0	R a t h a 6 . 7	S a r b h a 1 3 5	S o m h a 4 5	S t h o e r a 2 . 0 1 6	K o e r a 2 . 0 1 6	V e r a 2 . 0 1 6	N a t h a 2 . 0 1 6	S t h a 2 . 0 1 6	R m h a d h y e 1 . 5
K a n y a/ m ee	G a t h i 6 3	K a r n a d e 0	N a r a 2 0 5	M a y a m 1 5	R a j a m m 9	Y u d h a t h i 6	L a s e v a 4 0	K a s e v a 4 0	N o t h a r a 1	K o h t a r a 1	G a y a a 1	T a y a a 1	P u n y a a 1		

n a		3 1			1 2	. 1	7 3	. 1				2 3	. 6	. 3	1 1	
K u m b h a/ th ul a	B h o t h i 6 4	P h a 3 2	G h u r a 2 3	S u r k a 1 5	S r e y a n 1 2	M a h u 9 5	S a d h t h a i 7 5	M u k t h i 6 5	V a n h i 5 4	S i a v a g h i 3 7	S a n l a h 3 2 7	L o u t h r a 2 7	C h i h r a 2 6	M u k h i 1 5		
V ri sc hi k a/ m a k	J a t h a 6 8	B r i g h u 3 9	K r o g h r a 2 2	C h a m y p a 1 2	R a m e p a 1 2	N a t e j o 1 0	T h e h o i 8 6	G a t h i 7 3	G o p h n a 5 3	V i s b h n a 4 4	S a b h v a i 4 3		K a v i 4 1	R a b h a : 4 0	S t h o l a m 3 7	

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n	t	a	h	m	a	u	h	e	t	e	a	m	a	a	a	
us	h	a	r	y	1	1	e	r	h	e	5	a	4	v	a	
	a	3	a	a	3	1	9	t	a	n	3	5	5	i	m	
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3. Grahananyaayadeepika of Parameswara

In this short work Parameswara speaks of the principles of eclipses in detail. The first thing he mentions is the distance between the central point of Sun and moon and earth.

The distance from earth to sun is 459585 yojana. To moon it is 34377. These are respectively multiplied by the karma or radius of the orbits of each, and then divided by Thrijya (3438) and thus the real distance from earth to sun and moon obtained. This is depending upon the time and position of earth in its orbit. 3438 is in minutes. Divide by 60 to get 23 Hora and 58 minutes. (the dinadairghya) and this number is used as the chandravyasa in Indian astronomy right from the beginning. Till 18th century Europeans

did not know why such a fixed number is used by Indians in calculations ,yet we teach students that India had borrowed its astronomy from outsiders.Now modern science of astronomy uses chandravyasa as 34375,while Indians were using 3437.5 as decimal and made it a complete number by making it 3438. The ratio of distance of earth to sun and moon is 1:13

34377:499585

499585 yojana multiplied by 8.8 gives 302517.6

Divide by 3438 we get 1176.3 and 87.9(which is written as 88 and in decimal as 8.8)

This is to measure the lightray,its distance,time of spread,the gathi of it,and its shadow cast which is all about the knowledge of eclipse.

Ravisasibhooviyasam

Suns vyaasa is 4410, moon's 315 and earths 1050. To make yojanaas into kala (karma or thrija being in kala) we have to see the sphutayojanakarna and multiply by thrija.

For sun $4410/459585 \times 3438$

For moon $315/34377 \times 3438$

Ratio of Moon;earth;sun=315:1050:4410

That is, earth is 3.3 more than moon and sun is 14 times than moon. in the size of the gola. Thus the 3 gola and their distance, and bimba and the ratios between them are first obtained.

Distance earth : moon 1

Earth : sun 13

Bimba moon : earth:sun=1:3.3:14

In grahana or eclipse the gathy and kaala of sunray and moonray are calculated with the same numbers as the modern

astronomers now use is significant .To demonstrate that see below the modern units of lightyears (kpc,mpc,kiloparsec, megaparsec)

One parsec= 3.1×10^{13} =3.3 yrs

One kpc= 3.1×10^{16} =3.3 thousand years

One mpc= 3.1×10^{19} =3.3 million years

It is in this way the 33 crores of prakaasadevaas or light rays are calculated by Indian scientists.If one have to make a diagrammatic representation of this ratios of earth,sun and moon,one has to show earth as center and sun in the periphery.Figure below.

But if this is being communicated to people who do not know the basic rules of grahana ,it is misunderstood.Ptolemy when he learned from India made this mistake perpetuated by several

astronomers for a long time. Since the observer sits in earth, the dinadairghya or 23 hours 58 minutes is constant for him, and hence 3438 as karma in minutes is constant for all calculations of all structures as far as the observer is concerned. Therefore the bhookendra sthithy of the observer is important for calculations. This is a basic lesson for astronomy which the Ptolemian astronomers of west could not grasp and they said that earth is central, whereas Indians knew that Sun is central but for calculation one has to take a geocentric view. $15 \text{ thithi} \times 24 \text{ hours}$ gives 360 Thithy \times raasi or 15×12 gives half of it. If thithy is multiplied by 23.58 the exact value is 359.5 not 360, and this shows how accurate they were in using Thrijya for calculations. In Panchasidhanthika also we find the same rule.

The bhoochaaya or image of the earth is measured by a sankudeepa. The vyasadala of sun is the same as the height of the deepa. That of earth is the same as the height of sanku .The distance between sanku and deepa gives distance between earth and sun in yojana

The distance between sanku and deepa multiplied by sanku ,and divided by the difference in their heights gives sankuchaaya which is the difference between bhoochaaya and difference between heights of sanku and deepa.

In the moola or base chaya is equal to bhoovyasa. In the end it is elongated as the tail of a cow (gopucha) since sunrays fall everywhere equally. If sun is a deepasthamba or a dwaja or yupa of 12 feet ,earth is a sankhu or a conch of 12 angula only. One is light and the other is

naada. The sanku should be made as a sreeyanthra in thrikona, pyramid shape. To see the length of chaaya at chandrasthaana

Formula is $\text{chayadairghya} + \text{distance between moon and earth at center X bhoovyaasa}$ divided by chaayadairghya , multiplied by thrijya and divided by $\text{distance from moon in yojana}$ we get chayavyasa in kala.

Suppose the chayavyasa from chayagra is same as bhoovyaasa , how to find its vyasa at chandrasthaana ? First see the kala as we saw for the moon. bhooovyaasa and thamovyaasa are same since thamograha is Rahu or earth itself. The statement that the earth's shadow has a gopucha like elongation is noteworthy here. Earth has a tail and with its vyasa the eclipse of moon and sun happen was

known to astronomers of India(see the word ulka as used in Dravidadesa and Indonesia described in previous chapter) From the diksoothra of an observer from earth how much time sun and moon stay ,will be the time or duration of an eclipse. How much moon stay in earths shadow will be duration of lunar eclipse.In pournami moon travels through center of chaaya.The yoga of sun and moon will be just before or after the new moon in amavasi.This is because of lambana or parallax.

Madhyahnalagnam or point of ecliptic on meridian is traditionally by

Lankodayapramaana natanaazhika ,by adding or subtracting surya rekhansa from lagnakhandam according to

Parameswara ,just like Varahamihira and the astronomers before him.That means whether the observer is in Ujjain or in

Kerala, whether it is in 5th century AC.E or in 14th century ,Lanka was accepted as the meantime just as we calculate GMT after we became colony to British.

Drikshepalagna is praaglagna minus 3 raasi .

See local meantime and lanka rasimaana and natanaadika according to it. The segment of ecliptic or madhyakhanda to it is seen and reduced from suns rekhansa, and in afternoon madhyalagna is added to suryarekhansa just as described by Varahamihira and the earlier astronomers like vasishta and Paithamaha.

Madhyajya is the ज्या of madhyalagna. It is obtained by adding or subtracting declination of madhyajya and akshamsa. Madhyajya is madhyadrikjya or the highest distance of madhyalagna. Its

sanku is called Madhyasanku, (cos
madhyajya)

Madhyajya=madhyalagna, akshamsa
(either addition or subtraction as the case
may be) The sine of the sum or angle
thus obtained

Drikshepasanku is the sanku of
drikshepalagna or the cos of
drikshepalagna

Madhyasanku X thrija/madhyalagna
minus praaglagna

Golathrikona being a samakonathrikona
the rule of cos and sine is applied here
just as Varahamihira did.

Madhyalagnajya minus Harijam is
madhyasanku. Then how to find
drikshepasanku with thrija?

Mahaachaya =drikshepajya

It is height of karma and mahachaya of
graham . Driggathijya is its bhuja.

The vargamoola of drigjya minus the root of sin drikshepa gives sine driggathy. The position of observer is different because of the change in position of earth. Therefore one has to calculate driggathijya considering change in rekhansa. The difference in akshamsa due to drikbheda is measured with the drikshepajya. It is same as the chaya or sine uchabhedam. Therefore drikshepajya is the same as drikjya. Drikshepalagnajya minus sine zenith distance of nongesimal.

Inkhamadya drigbheda is soonya or zero. In harija and in antharala the bhoovyasa in its kakshya is found according to sine of zenith distance and its ratio.

The picture for this calculation in its poorvaroopa is seen in the Harappa/Mohenjadaro pictographs. Which shows

the antiquity of the knowledge of astronomy and of zero in Indian subcontinent.

When the observer is the center point of observation (local time) the direction of drikbheda is upside down.(sloka 23)

Lambana or parallax is according to distance of zenith distance and its sine(difference of mahaachaya) But rekhansalambana can be obtained from driggathijya itself. Drikshepajya or lambanam from akshamsa(parallax in latitude)is called Nathy.

Lambanaamsa of rekhansa is ansa of ecliptic. Nathy is the parallax which is at right angles to ecliptic.

Drikshepajya, driggathyjya, are multiplied by half of earths vyasa and divided by thrijya to get akshamsalambana or nathy and rekhansalambana or lambana

respectively in yojana in orbits of the planets.

Since drikshepajya and driggathijya are equal to thrijya ,their nathy and lambana are equal to half of vyasa of earth.To see nathy and lambana of any drikshepajya and driggathijya respectively divide by sphutakarna (distance from earth)and multiply by thrijya .The results will be for the particular graham in the same thrijyavritha.moons akshamsalambana minus suns akshansalambanam gives the nathy used for calculation of eclipses .Those of moon have to be found out from those of sun.The lambana and nathy of moon and sun are equal in yojana but different in kala or minutes. Kala will be more for moon than sun.

driggathijyaX bhoovyasardha/mean
distance of earth to moon X 60/mean

gathy of moon in a day gives
 lambananaadika of the eclipse
 Therefore driggathijya /863=
 lambananaadika

Parallax in longitude in naadika is
 driggathijya

The errors due to usage of moons
 madhyamadoora is removed by division
 with mean daily motion. To remove all
 the errors (samasthalambanadosha) one
 can just divide with the samasthagathi of
 moon for one day.

There are 3 different methods used by
 astronomers

1. akshamsa of drikshepalagnaja plus
 highest distance of drikshepalagna to get
 drikshepalagna in chandrakakshya
2. others add chandralambana
3. adding akshamsa, rekhansalambana
 respectively

Drikshepajya/863 X difference between
moon and suns dinagathy/60=
sphutanathy

In the morning Parvaantham minus
lambanam

In the afternoon parvaanthum plus
lambanam

Because moon is always below relative
to sun

Parvaantham is lunisolar yoga or the end
of amavasya. To calculate lunisolar yoga
, lambana is to be found by adding
lambana if moon is on western side of
sun and subtracting if on the eastern side.
Here poorvahna, aparahna are to denote
whether the position of sun is to the east
or west of the drikshepalagna (if east
poorvahna)

To do lambanasamskrithakriya one has
to find the lambana for yogavela upto a
point when there is no difference

between two results (either $x-y=0$ or $x=y$) That is one has to see the integer to the nearest.

Thus the samskrithalambana is equalized and called sphutalambana.

Sphutalambana does not mean the lambana at yogavela. From the very first lambanavela there is parallax for the grahan and it is not sphutalambana. Or it is not parallax but the calculation without lambana or parallax that is called sphutalambana. The madhyagrahana of sun happens at yogavela where there is lambanasamskrithy is done without parallax. At that time the straight line(ray) that pass through center of sun and moon also passes through the observers eye in straight line. The moons akshamsa used for suns eclipse is akshamsa of grahanamadhya added with drikbramsa of that period. If they are both

in same direction.If in opposite direction ,minus them.See chandralambana from moons position at akshamsa agra.and from the nathy from there.The direction of madhyajya is direction of drikshepa and of akshamsalambana also.According to the kshepa of a bamboo the thread fastened to its end also changes.Similarly the lambitha of akshamsa also changes with drikshepa.(same is said in Panchasidhanthika of Varahamihira in 5th century)The bimba that is grasped,the bimba that grasps and their touching (sparsa)and at that time the distance between their centers which is the sum of their radii are to be known.Contact circle(samparkamandala)is drawn with this sum as radius.

When sun is in center and moon is within samparkamandala ,it is solar eclipse.In lunar eclipse the the time of eclipse is

from the first sparsabindu to the last sparsabindu. Sun is always considered at center of samparkamandala. Moon in grahanamadhya is at equal distance from samparkamandalakendra to his own kendraakshamsa. Moon is in the paridhi during first and last sparsavela. This statement shows that the real suns position as center (heliocentric) has to be known for eclipse prediction .And Indians knew it.

The successive approximation method of Parameswara and of Varahamihira shows how scientific Indian astronomers had been in their approach to problems of the cosmos and its laws.

Valanam and akshavalanam are described in detail by Varahamihira and by Parameswara. Valana is the deviation in direction of the ray of light which is

now called geodesic .Akshamsavalana is is the difference we feel due to akshamsa difference

Sine of latitude X sine of colatitude divided by 3438=akshavalanamThis is curved to north in morning and to south in evening.In the center there is no northsouth difference .Maximum difference is at Harija or horizon (according to Bhaskara 2 in

grahanavaasana this nyaya is wrong)

The fact remains that Miletus of Thales in Greece who predicted a eclipse for the first time according to textbooks

believed that earth is flat as a mat ,and such a man could never have predicted a eclipse (only if earth is shherical or gola it can cast a shadow on other gola like moon and sun is basic knowledge).

Varahamihira and Parameswara lived 1000 years apart.Yet we find them using

the same traditional Indian methods used by astronomers before them. Both have discussed the laws in detail and emphasized the importance of constant observation. It was during the time of Varahamihira 2 the Romance of Alexander was written in Greece and an Armenian copy for it came in 14th century. In this book there is a picture showing Alexander was born on a eclipse day. In it a triangle like a sanku and saptharshimandala with Arundhathy and 8 planets with lunisolar yoga of earth are shown.

Parameswara or Kunnathur Naagalassery Vadassery Parameswara called Drigganithaparameswara lived in 13th-14th century in Kerala and he did Drigganitha and parahithaganitha and wrote many books on eclipses and their

laws.His observations were from the
 banks of Nila in thirunaava /Alathhiyur
 Vadssery is the vadasreni of south
 Malabar(sundararajas vakyakaranaa
 vyakhyana ed T.S.Kuppannasasthry
 ,K.V.Sharma Madras 1962 pp
 8,23,93)He was born in Brighuvansa ,
 Aswalaayanagothra.Cheri ,sreni ,etc
 were names given to a group or
 samootha.The northern banks of river
 Nila ,where it joins Arabian sea we find
 Vadassery .It was a branch of kudallur
 mana.Parameswaran lived in Alathiyur.
 He has said that from the samarekha 18
 yojana west ,in 647 akshamsa (10.51
 N)in sakavarsha 1360 Goladeepika was
 written by him.Smarekha is here Lanka
 ,not Ujjain as many people have
 misinterpreted.9 yojana(correctly 8.8 -
 8.9 yojana)is one degree in gola.18
 yojana west of Lanka thus means 2

degree west of Lanka or with 8 minutes time difference ,and it is a wellknown golaniyama.The guru of Parameswara was Rudran and also Golavith samgramagama Madhavan ,Narayanan .Damodaran was his son and disciple and Neelakandasomayaji was another disciple. Parameswara did 55 years of observation from an observatory in South Malabar continuously and after that in 1353 saka(CE 1431)wrote Drigganitha .In saka 1365(CE 1443) Goladeepika 2 came.In CE 1445 (kali 4536)he wrote a major work according to Neelakandasomayaji.That is from 1431 backwards 55 years ,when he started his observation he must be just a child (in 1375)Somayaji was born in 1442. Parameswara lived from CE 1360-1455. His works were

- 1.drigganitha a karanagrantha

2Goladeepika 1

3 Goladeepika 2 Both these are on spherical geometry

4Grahanamandana

5grahananyayadeepika

6 Grahanashtaka (these 3 are on eclipses)

7 vakyakarana(astronomical tables)

8 bhatadeepika a commentary to Aryabhata

9.Parameswara

Laghubhaskareeyabhashya

10.sidhanthadeepika

mahabhaskareeyabhashya .These 2 are commentaries to Bhaskara 1

11sidhanthadeepika is a commentary to the commentary of Govindaswamy for Mahabhaskareeyabhashya

12 laghumaanasabhashya of Munjala

13.vivarana suryasidhanthabhashya

14vivarana leelavathy commentary to Bhaskara2

- 15vrithy vyatheepaatha ashtaka
,laatavaidhritha
16.vrithy bhashya to goladeepika 2
17.Acharasamgraha
18 jaathakapadhathy
19 muhurtharathnabhashya
20 bhashya to sreepathys jathakaadesa
21commentary to prasnasathpanchasikha
of prithuyasa
(from 17 to 21 are astrology books)
22muhurthashtakadeepika
23 vakyadeepika
24 bhaadeepika
(22-24 are not yet obtained)
In Aryabhateeyabhashya of
Neelakandasomayaji it is said that
Paramesara had yantra for his
observations .Varahamihira and
Parameswara used yantra and both used
beejaganitha for sphuta of calculations.
Both gives the importance of correction

by observations. Both call the sanskaara as Kaalaantharasamskaara though they lived 1000 years apart and one in Ujjain and the other in Kerala.

The kalidinasamkhyā of eclipses observed by Parameswara are given .The first was observed from Gokarna and Nilaathada, the second from Nilaathada and Samgamagraama, the 3rd from Naavakshethra and all others from Nilaathada. In 12262 days he saw 14 eclipses of sun.

Yanthra

The oldest astronomical yantra include sanku, chakara, Gadha, Padma, Venu (bamboo) sreeyantra etc. From the flutes of Neanderthal to symbols of the Indus

civilization we can see proofs of using such instruments by human race. Machayanthra and Golayanthra used by 5th century astronomer Varahamihira were used by Indus people of India also. In pracheenasuryasidhantha of 1000 BC these yantra are mentioned. In 700 BC Lalla's sishyadheevidhitha 12 yantraas are mentioned. In 1072 CE Bhaskaracharya, in 1506 Grahalaaghava of Ganesadavyaktha describe the same instruments. Continuous use of astronomical instruments from 6000 BC upto time of Sawai Jaisingh denotes the antiquity of the science and its knowledge in India. The yantra were using Rasa, Jhala, oil, sand, and chakra for functioning .

*Paradaaraambu soothraani
sulbathailajhalaanicha*

*Bheejaani paamsavashteshu
prayogaasthepi durlabhaa*

(paradaara is mercury or rasa.water,
thread, sulba,thaila,water,bheeja or
dhanya or grain,sand or paamsu are the 8
prayoga)The yantra rotated by mercury
in the wheel was golayantha used from
1000 BC

In Suryasidhantha the instrument which
used to measure the angles even upto
vikala was marked for

60 vikala=one kala

60 kala=one bhaagam

30 Bhaaga=one raasi

12 raasi=one bhagana

In CE 1072 Bhaskaracharyas Leelavathy
describes the yavadhanya ,angula,hashta,
danda,krosa,yojana for measuring
distance ,length and the same
yavadhanya is used in CE 427 by
Varahamihira .The machayantha is

based on this and this was used from time of IVC .Yojana is measured right from Rgvedic times.

8 yava=one finger or one angula

24 angula=one hastha

4 hastha=one danda

2000 danda=one krosa

4 krosa=one yojana

10 hastham=one vansam

(400)2 vansa=one nirbandha

Kaalamaanam is as follows

60 vipala=one pala

60 pala=one ghati

150 pala=One hora =15 bhaaga= $1/2$ raasi

24 hora=one dina or day=12 raasi=one bhagana

In this way time,distance,angle,and panda(bimba)or dravya which is matter were measured and they knew the interrelation of matter, timespace and energy.

In BC 700 Lalla described how to construct a golayanthra .The Golaor sphere ,bhagana or ring ,chakra or disc,dhanus or bow and arrow,ghati or clock ,sanku,sakata, kartharya,pishtaka, kapaala,salaaka were described as instruments used by astronomers by Lalla.The vansa or bamboo and dheeyanthra or venu (yashti)was also added to this later.The oldest sanku and measuring rods in India are seen during acheulean times by Paleolithic people.In the dwelling places of these cavemen archeologists have seen 8 holes with 8 pillars ,2 each in same size,and the holes measure 12 to 20 cm diameter .The same sized poles are in 80-120 cms distance .The depth of the holes 20-30 cm and in hilltops where there is rich iron ores.The Paleolithic people of Bager 1 in west coast near Naneghat Kukkuteswara

kshethra premises had a vedi with 85 cm diameter and made of stones and round in shape and in the center a sanku of triangular shape 15 cm height ,6.5 cm width and this calculation of $6.5 \times 15 = 975$ which is rithusapthanava of Varahamihira minus one is important. Varahamihira says specifically that 976 is a samkhya used by the people of Bharathadesa from time immemorial for the astronomic measures. And the people of acheulean caves in India also were using measurement just one minus of this samkhya. This shows that Indian astronomy evolved from the Paleolithic age from the people of this land itself and no one brought it from outside. The nearby graama of kaimoor has a similar triangular stone worshipped by villagers as Maayi(mother goddess)or sreeyanthra. That is sreeyanthra worship as sankhu

was there at least from 9000-8000 BC in India. In villages the mountain itself, or a pillar, and even a high tree was used for measuring the chhaya. The astronomers watched stars from mountains and from astronomical observatories.

Jalachakrayanthra and jalanaalikayanthra were used for travel in sea and for agricultural purposes. The chaapayanthra of Bhaskara is a protractor. It combines a dhanus and danda of Lalla. It was used for finding cosine, sine, angle measurements, radius, distance from planets etc. T.M. Sreenivasan (Waterlifting devices in ancient India. Theories origins and mechanisms. IJHS 5:379-89; 1970.

384:5-7) describes the shaduf lifting system depicted on a Mohenjo-Daro seal and oxenlifting water from wells and sweeps near the remnant pools which require unceasing labour of both people

and livestock was a feature of Indian agriculture from time immemorial and prehistoric and historic India gives oral/traditional/and historical/ archeological evidences of uses of such devices .

Jalanaalikayanthra

It is combination of a sanku and a naalika over it. There is a jalapaathra in which image of sun(or star)falling in water in it. For watching eclipse of sun water with cowdung was used to protect eyes from ultraviolet rays of sun. The principle of the yantra used in Panchali swayamvara and in sudakshina swayamvara (sudakshina is one of krishna's wives) is the same. The ability to watch the image in water and to point the arrow to the real , was a test of ones

concentration, astronomical knowledge, prowess in wielding bow as well as the eyesight and avadhaana. Without knowing the law of parallax this cannot be done. The jalanaalikayanthra was used in ships to note the stars and their parallax. This symbol is drawn at a 90 degree angle in Haiti by women and they have a type of healing with this symbol and they call the symbol a Woodoo.

Jalachakrayanthra

Using rasa or mercury this was for drying up water from fields and for irrigation by siphon action. The yantra need not be started by feet as ordinary water wheel. Water is the source of energy. When water fills a prathala (a cup in picture) wheel starts rotating itself and rasa moves from one to another naali and

by imbalance the movement is perpetuated. If there are 4 jalasambharani each will rotate the wheel to 90 degree and thus 360 degree motion achieved so that it can act as a waterclock. The puppets of Perumthachan and his son were functioning according to this principle. Sidhanthasiromani gives full description of it. The fields of cultivation with small holes beneath as in Mehrgarh period served as draining trays for such irrigation methods. In kerala the punchakkol fields had to be prepared by this method before cultivation. If water flows continuously chakra functions continuously. The needle that moves according to the rotation of wheel, the float in the water level etc were used as jalaghatikaara of a mass scale as by the Greeks. The fact that from Paleolithic acheulean caveman of before 9000BC to

AD 1500 years the same type of measurements by the same type of yantra was done by people of India is a thoughtprovoking fact and it is a strong proof against Aryan invasion theory as well. Evolution of a human race indigenous to India is a more plausible explanation than invasion from any other part of world.

Volcanoes and tsunamis and floods

3500 years ago Santorini and the neighbouring island of Crete of Phoenicians were lost in the large waves that followed a volcanic eruption and almost 1500 years before that India also witnessed a loss of Dwaraka ,the island city of Krishna off the coast of Gujrath. Just as the yaadavaas of India had a

collapse with this loss of a city,,the Minoans collapsed following Santorini eruption,Greek archeologist Spyridon Maninatos wrote in the Archeological journal Antiquity .He was drawing his observations from the 1883 eruption of Krakatoa in Indonesia about a third in size of santorini ,which was heard 4600 kms away and created a series of giant waves.Tsunami swept south from Santorini destroyed the Minnoan city and maritime powerbase and the coastal population involved in trade relations, and thus weakened the civilization.With surprising accuracy he put the date of Santorini eruption as 1500BC.

Herodotus, Homer and Thucydides had described the maritime civilization of Minoans based at Knossos on the island of Crete.They had a naval fleet,the first of its kind in European history and drove

away the pirates and linked the colonies through the eastern Mediterranean. In 1878 Cretan Minoan Kalokairinos excavated Herakleion near Central north coast of Crete and found a throne room and palace store rooms. In 1880 Heinrich Schliemann found the house of King Minos. In 1900 Sir Arthur Evans excavated after contacting Kalokairinos. A sophisticated extensive palace, technology for supplying clean water for 2000 people surrounded by a town with a population several times that size was unearthed. The township was built around worship of the bull deity (The Minoan horns were seen throughout Crete) which is very much like Indus valley civilization. The roads were all paved and there was a theatre, the first ever described in Europe. The Minoans existed as early as 2000 BC and traveled

through eastern Mediterranean but who they were and how they came to crete is still not known .My propositions are they are Phoenicians who actually were South Indian Paneesha(kings of Naagaas)or Phaneesha in Sanskrit.These names are seen in both Prakrith and Sanskrit old texts.The pottery of Minoans are bridgesprouted jugs,stirrup jars and stemmed cups and the style was seen changing from time to time.1890's British archeologist sir Flinders Petrie found Minnoan pottery in Kahun, Egyptian site.Minoans had 4 distinct cultural periods.

1Prepalace period 2600-1900 BC

2.First palace period 1900-1650 BC

3.Second palace period(the peak period)1650-1450BC

4.Postpalace period 1450-1100 BC

Marinalos found two styles of second palace period at Crete.

1 Pots,jugs,vases cups covered with horizontally banded decorations and spirals of floral designs.

2.Inspired by the ocean ,with many images of octopuses,covering the vessels.

These were at two separate times

One early second palace period
(horizontal banded group)

Second late second palace period(ocean inspired group)One question we have to ask is ,why was the Minoans not inspired by ocean till late second palace period if they were habitually ocean goers?And why a sudden inspiration?We will come to the answer later.

In the southern part of main Santorini island of Thera the major settlement Akrothiri was excavated from volcanic

deposits since 1870. It is 150 meters across excavated which is a small part of the substantial settlement. Frescoes, houses with jars, benches, stonemills (like those still used on the island) were present. Two or three storeyed buildings showed that the Minoans were skilled builders. Pictures of the Minoans resemble keralites in several respects and the lady who resembles a Ravivarma portrait is very eyecatching. There was nobody in the buried city and plenty of food was discovered unlike Pompeii another city buried under volcanic ash several years later. The Minoans were aware of the earthquake and volcanic eruption, and had time to escape. In early phase pottery two vases with Godlike statues and decorated with a double-axe and head design show their religious attitude. In 1980 Santorini ash was

discovered in Rhodes island in Greece and radiocarbon showed its age not as 1500 BC but 1600 BC. In 1984 Valmore Lamarcke reported unusual period of narrow rings in Bristlecone pine of America in 1628 BC. They argued the Santorini eruptions had global consequences. Release of ash particle, sulphate gas, reflect the increasing sunrays resulting in Northern hemisphere cooling. In 1988 this was supported by Irish bog oak studies. The icecore data of Greenland placed the eruption at 1645 BC. A view raised was that global cooling can occur due to other causes, not just one volcanic eruption, and it need not be santorini eruption, but any volcanic eruption anywhere can cause it. The twigs and seeds buried in Akrothiri showed their age 3355 years ago, or 1650 BC. In Anatolia, the burial chamber Midas

mount Tumulus at Gordion ,the oldest standing wooden building in the world (over 2500 years)showed the date of the growth spurt of the wood in1645 BC. Could this then be the date of Santorini eruption was the question asked by all? Tephrochronology(using volcanic ash to link different sites)in Greenland ice 1645 BC layer of volcanic ash was found.But on follow up they came from an Alaskan volcano(Aniachek)not from Santorini. But the growth spurt of the Anatolia wood cannot be by the Alaskan volcano. Treerings are mandate from heaven and occur due to 11 year cycles of sun.and dendrochronologically the time of santorini eruption is now fixed as 1650-45BC.And as we saw earlier in 1628 BC xia dynasty inChina came to an end after seeing an unusual celestial natural phenomenon.

The enthusiasm to study the bristlecone pine had killed the career of a budding scientist. He examined a tree with ring numbers of 4950. That is the tree was growing during the period of construction of the pyramid of Khufu on Ghiza plateau. The young scientist who did this in 1964, had killed the oldest living organism on the planet for a tool that he could not have replaced for a days wages. The young man never worked as a dendrochronologist again and preferred to remain nameless.

The Viking ships were all dating to end of 10th century AD except one which was AD1042. So there is nothing in common with the Vikings and with the cretans of Santorini, one should understand. But they had everything with the phaneesa (serpant kings) Or Phoenicians of India.

which we will see with the chronology of them in another book.